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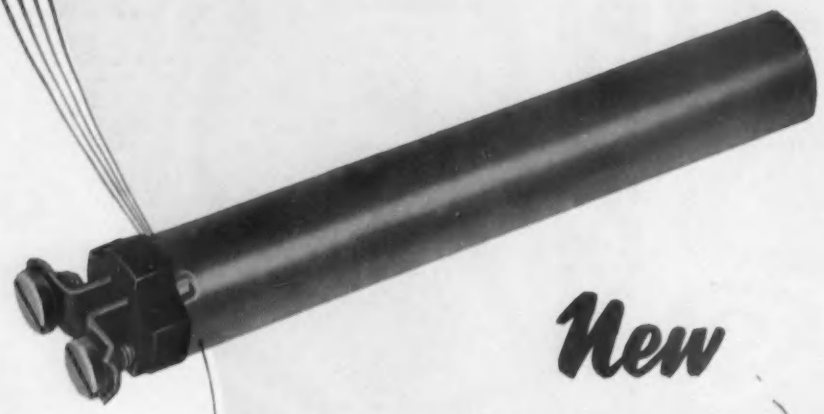

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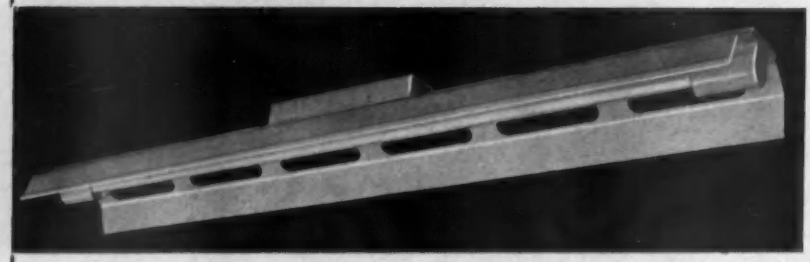

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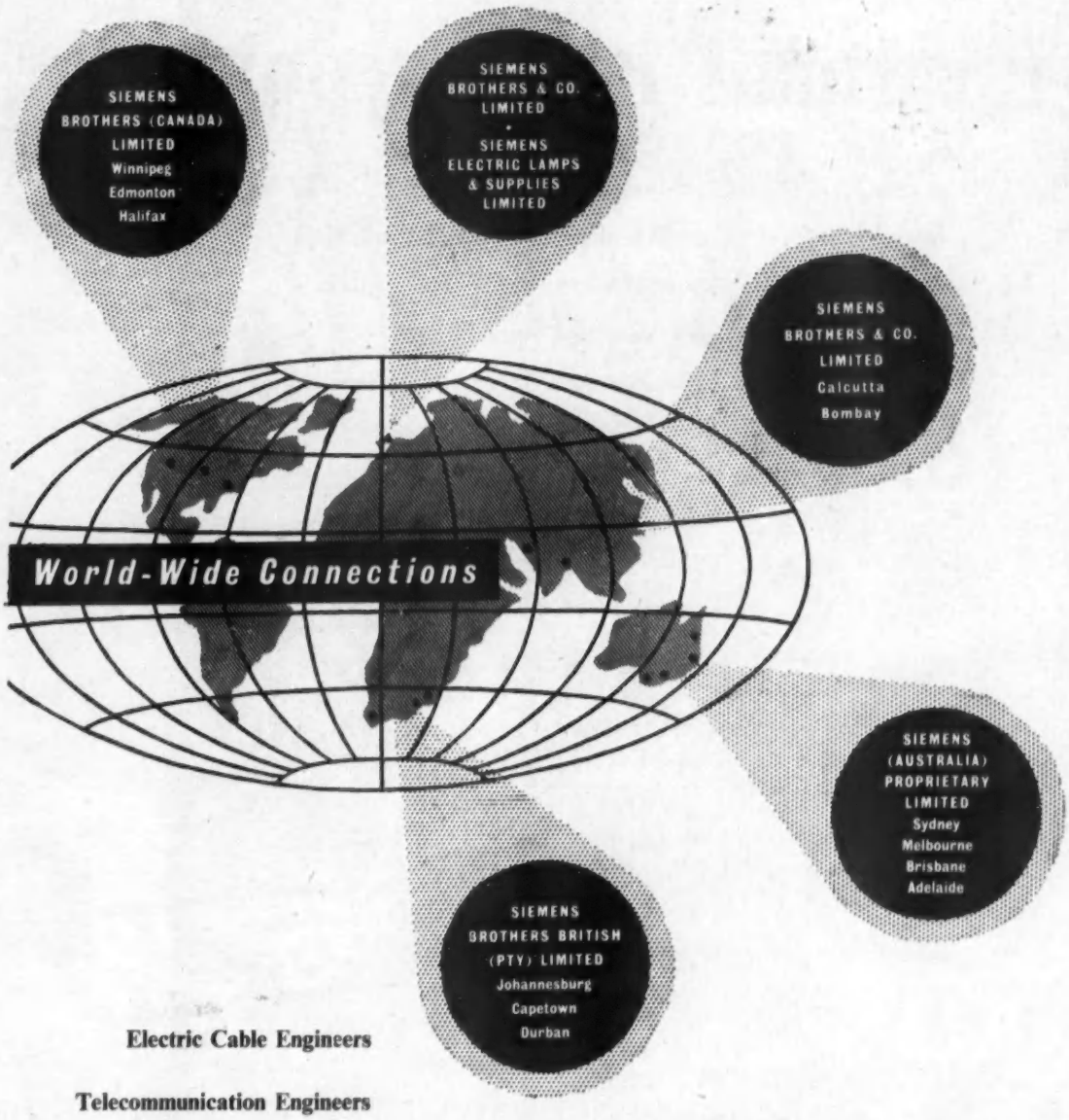

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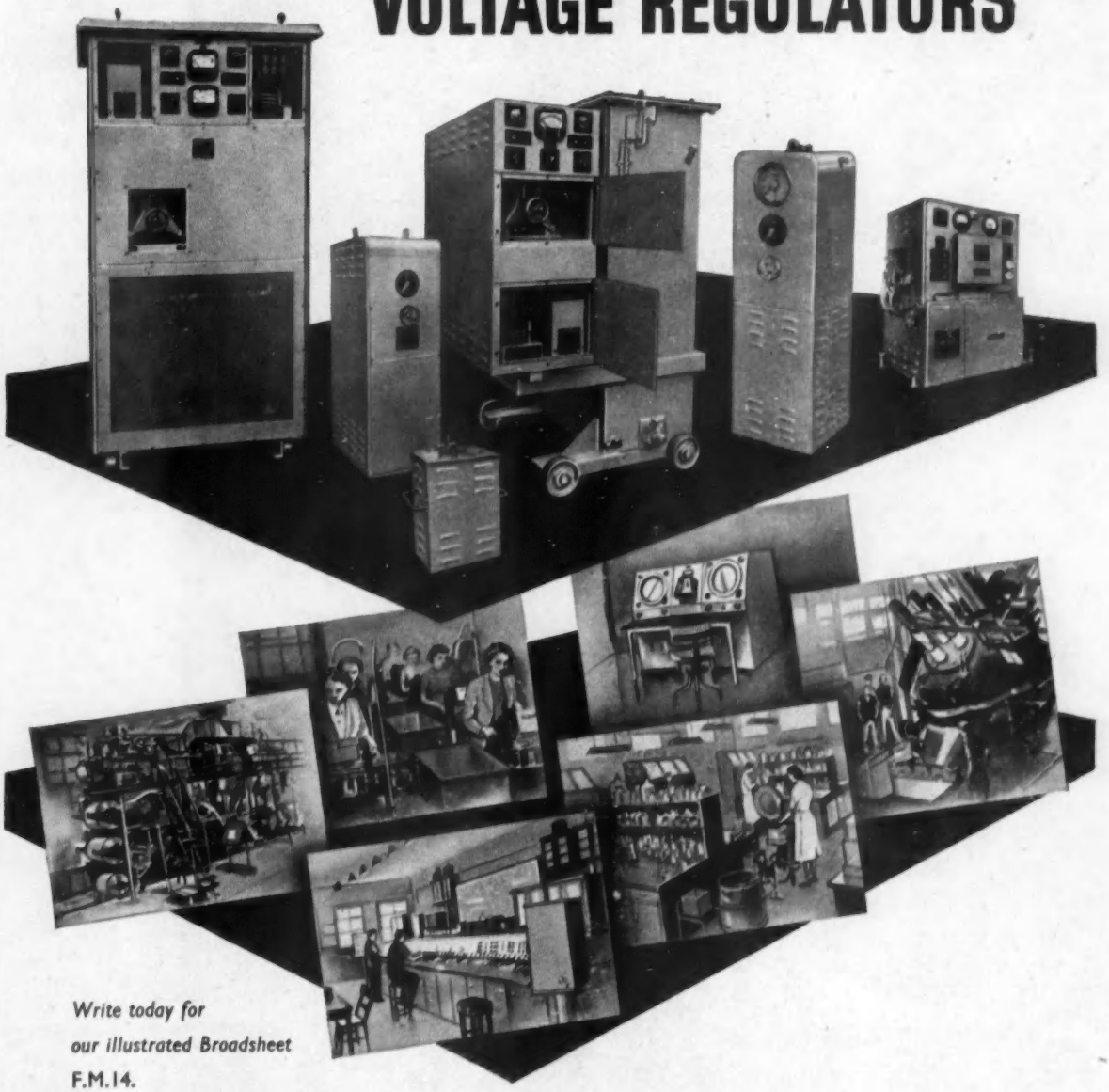

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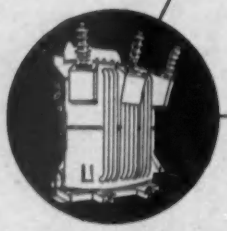

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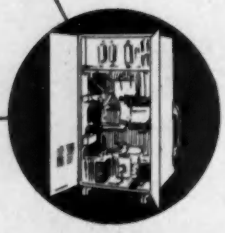

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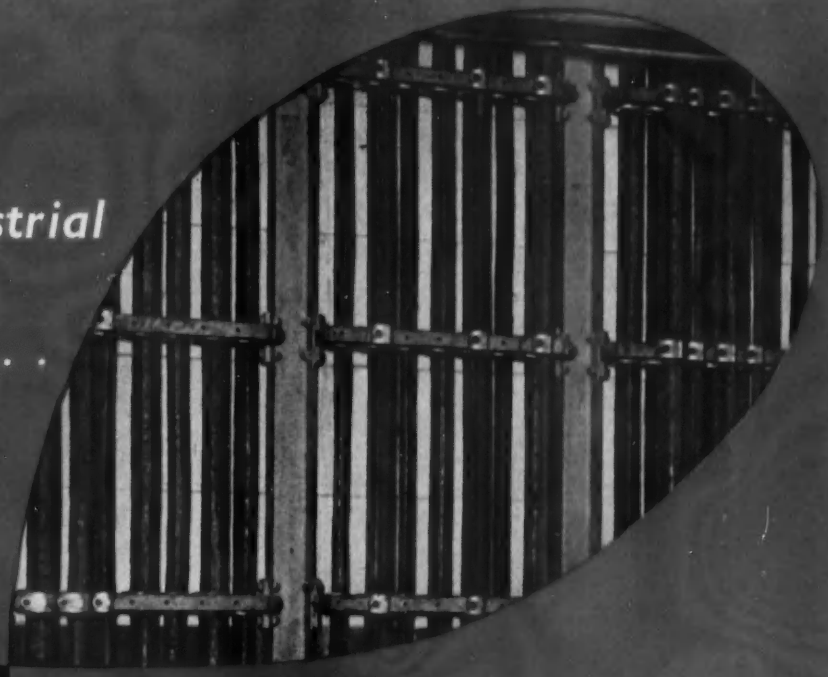

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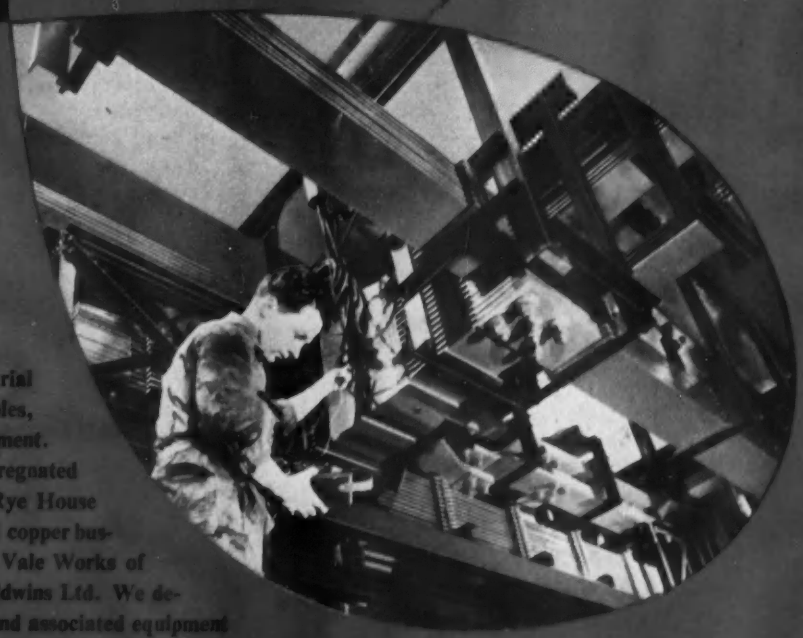

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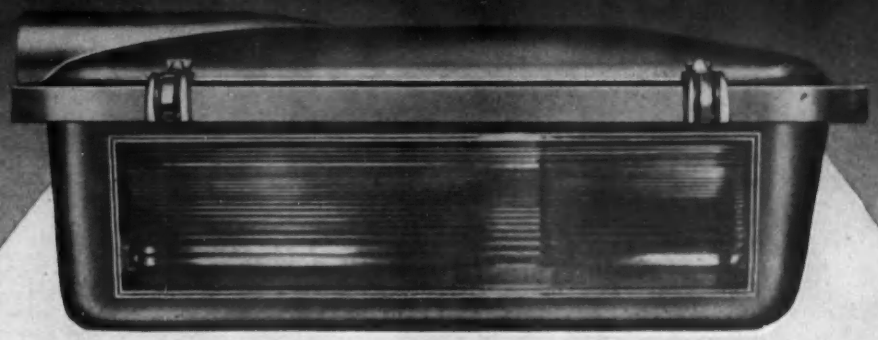

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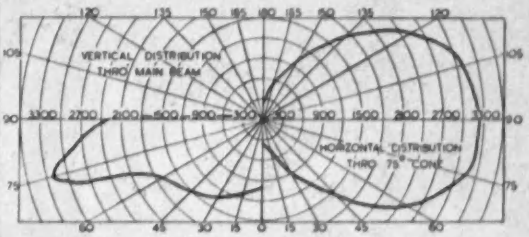

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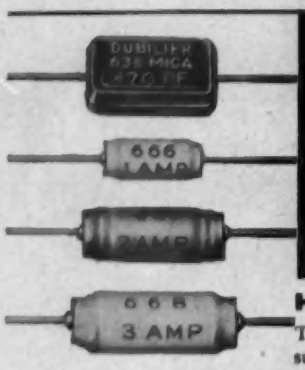

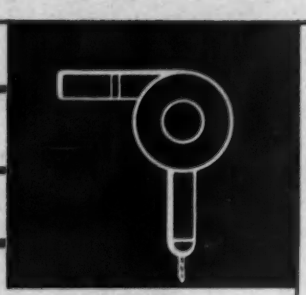

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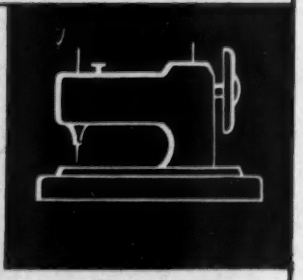

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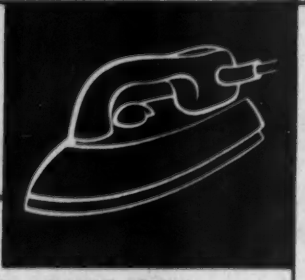

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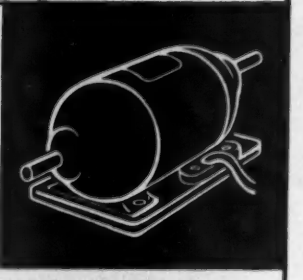

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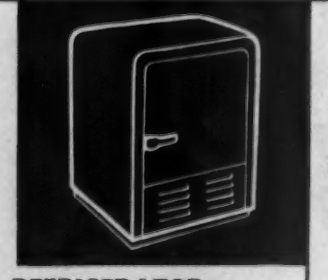

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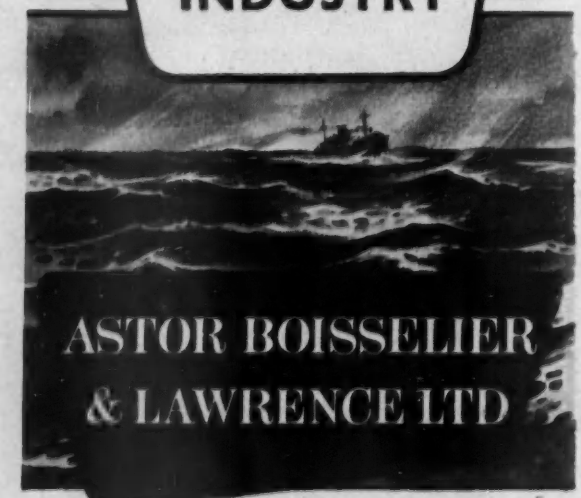

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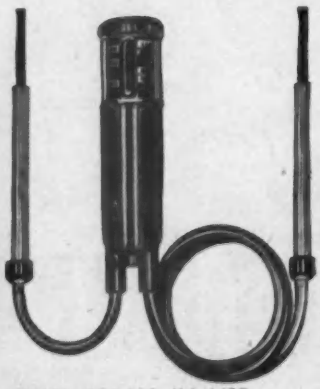
MODEL 54



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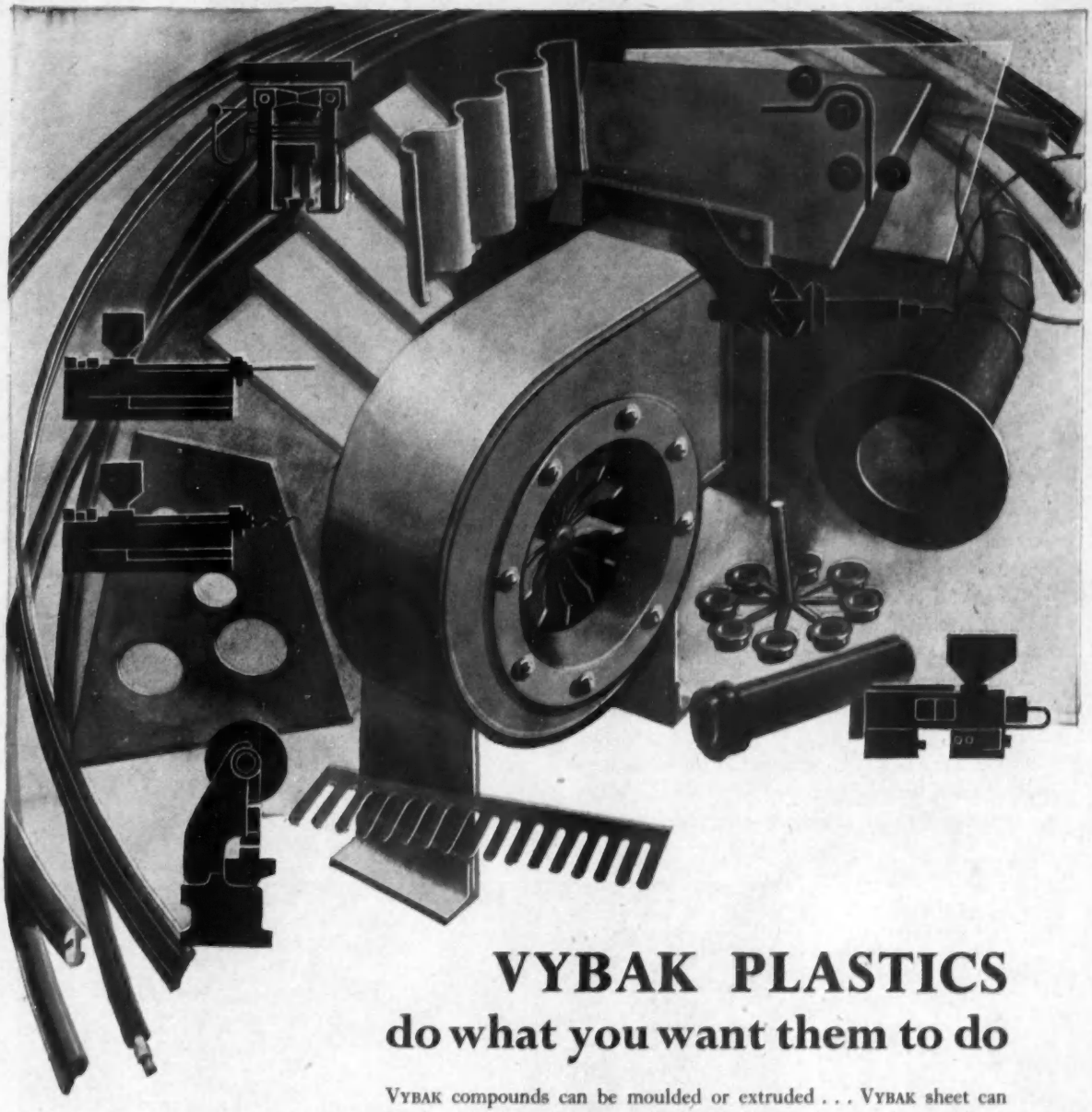

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The original building was situated on the old White City Exhibition ground. All the steel work was dismantled, transferred to Plaistow, renovated, re-painted and re-erected, thus providing additional warehouse space in quick time and without the many problems of obtaining new materials.

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By using ENFIELD GRID SUSPENSION SYSTEM the electrician concerned erected 260 feet a day, including 8 light fittings and 2 feed points. This was twice as fast as any type of conduit installation and represented a great economy in time and materials.

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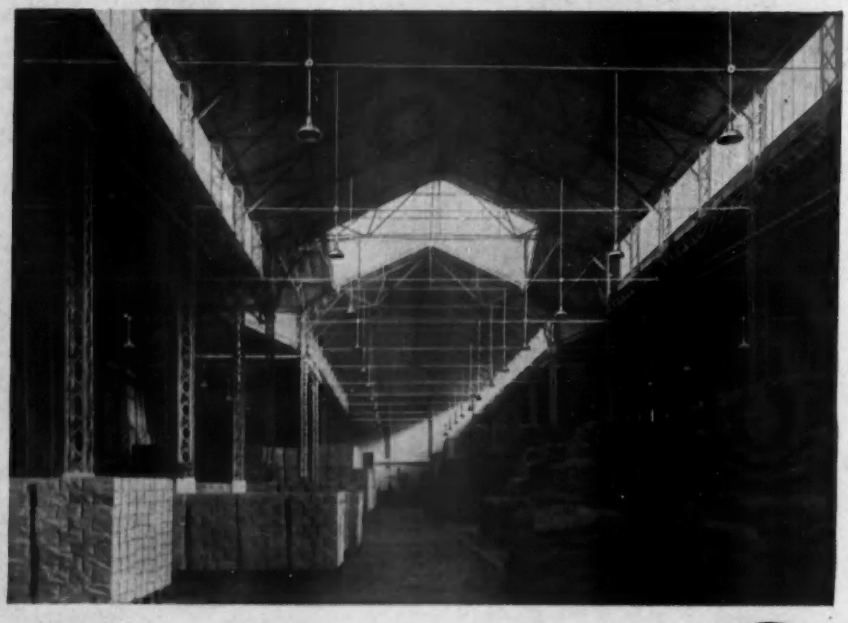

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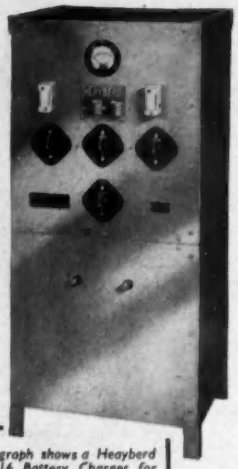
List No. 1048 describing over thirty different types of Battery Chargers is obtainable on request.



The photograph shows a Heayberd Model 6716 Battery Charger for charging from 3 to 36 cells at two to sixteen amps.

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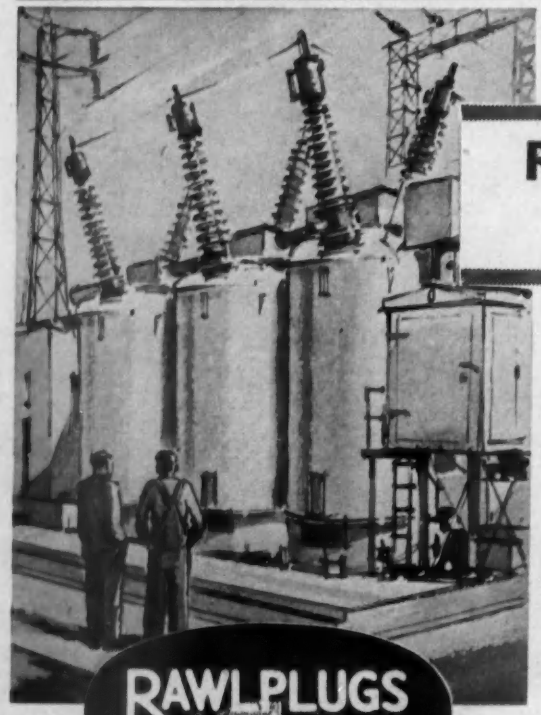

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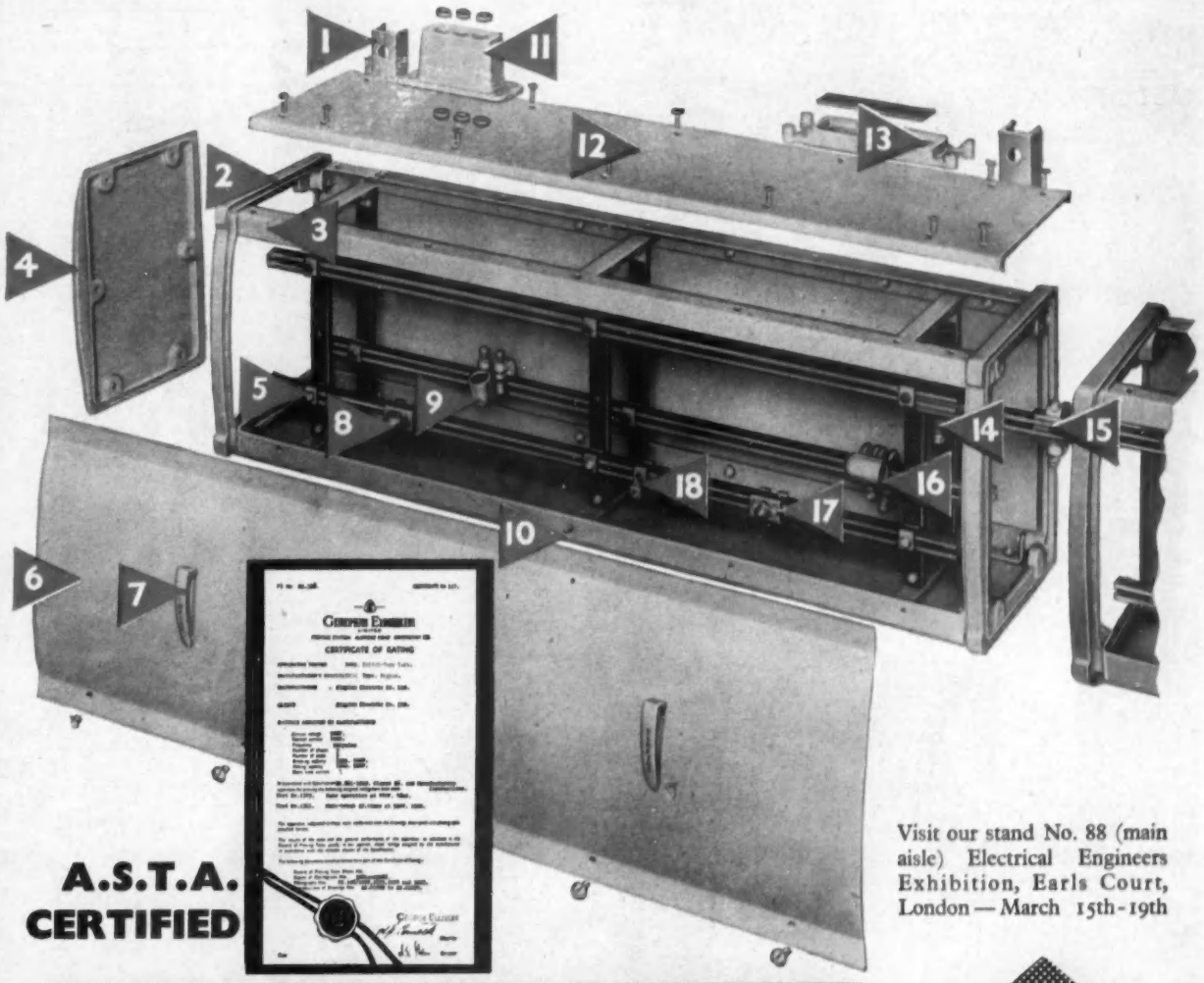

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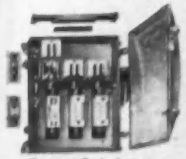

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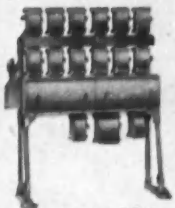

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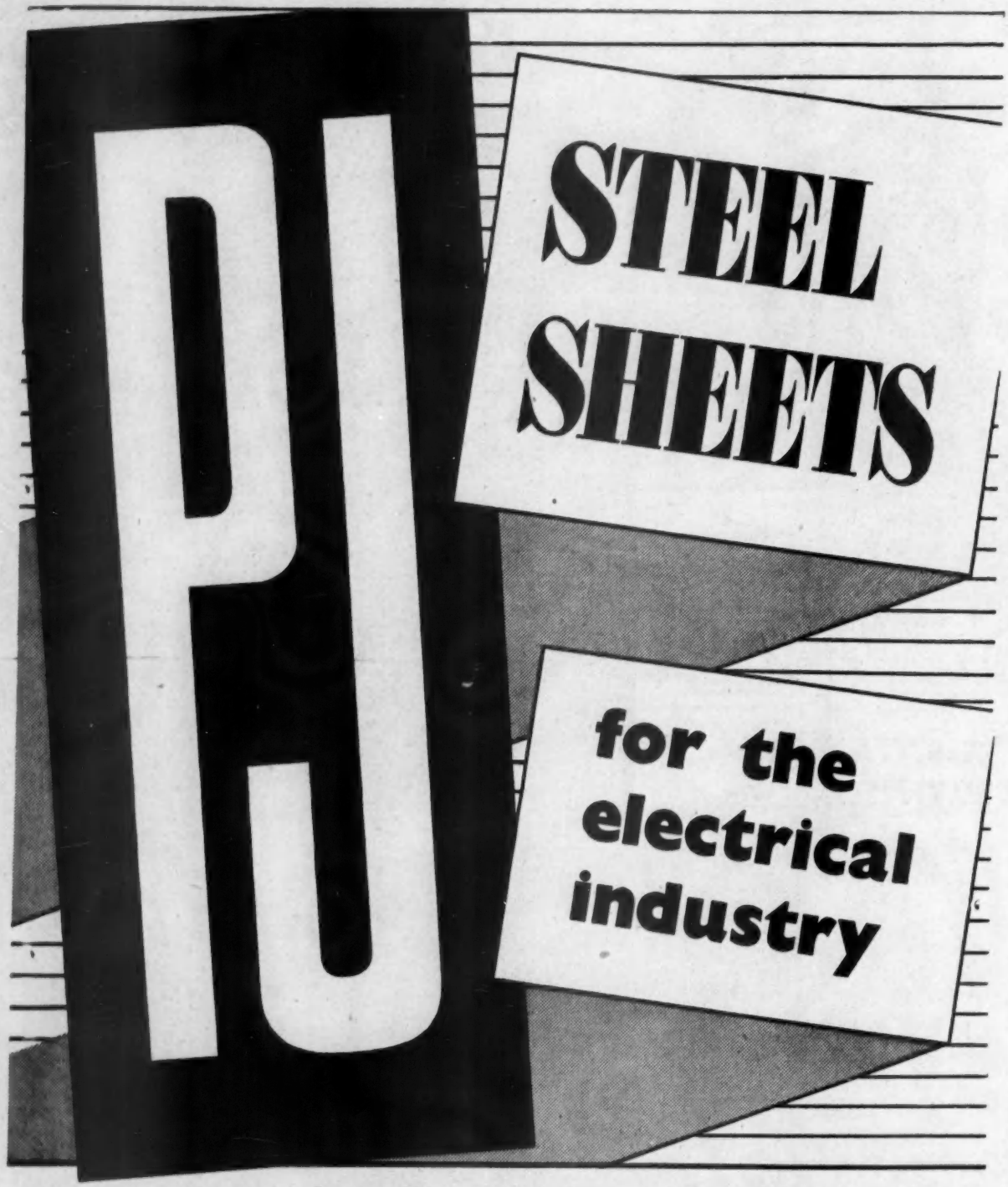

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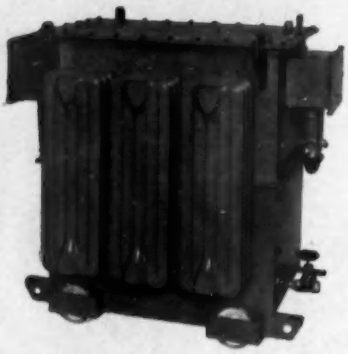

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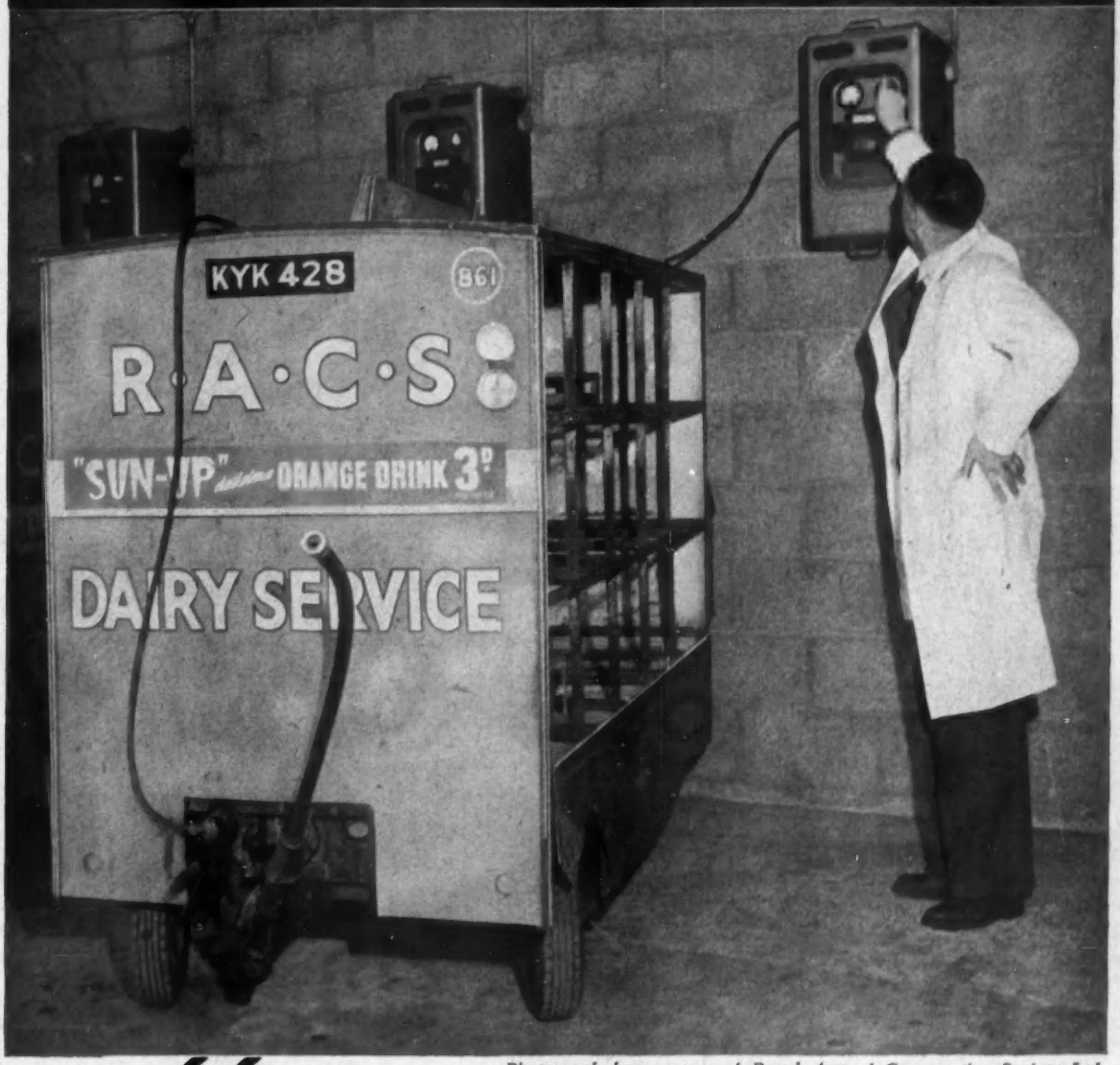

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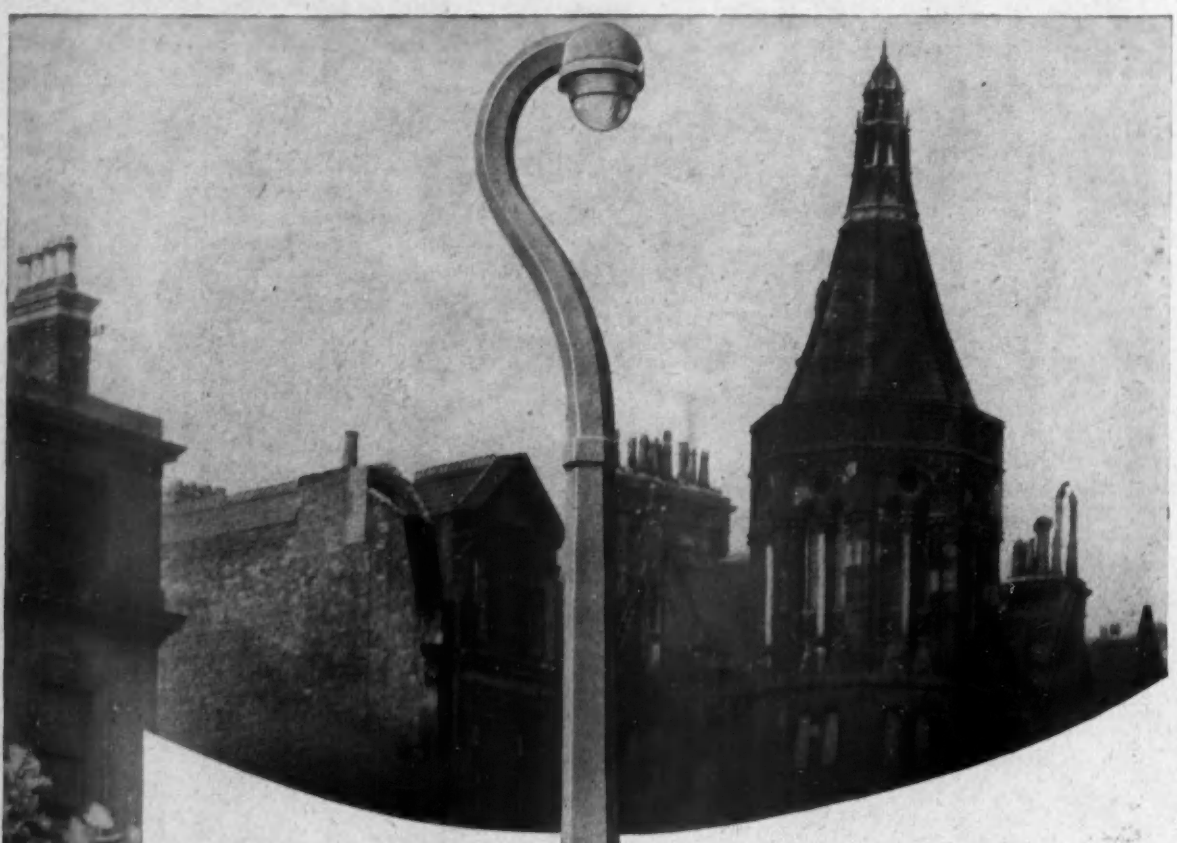

Right up your street

Grace and simplicity go together in the newly-designed Crompton 'Concept' for side-road lighting. There is a welcome simplicity, too, from the point of view of upkeep. Careful construction has made painting needless, and cleaning negligible.

Crompton concept

STREET LIGHTING

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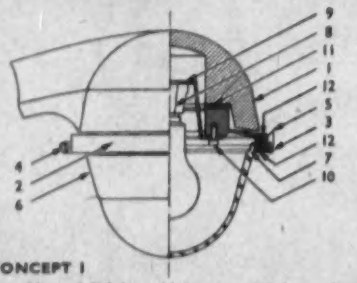

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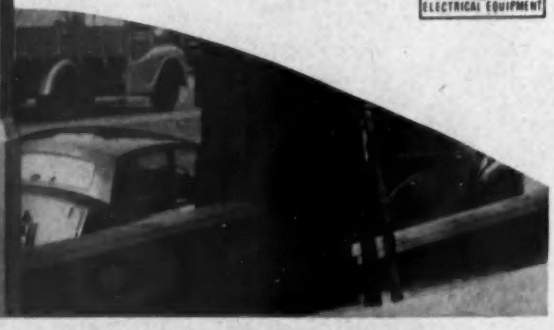
For side-road lighting with tungsten (100/200 w) or mercury lamps (80/125 w)

1 Concrete head
2 Casting bolted to (1)
3 Bowl ring hinged to (2)
4 Self-retaining hinge bolt
5 Toggle clip
6 Prismatic glass bowl
7 Bowl retaining clips
8 Lampholder
9 Adjustable lampholder bridge
10 Earth terminal
11 Gasket
12 Gaskets



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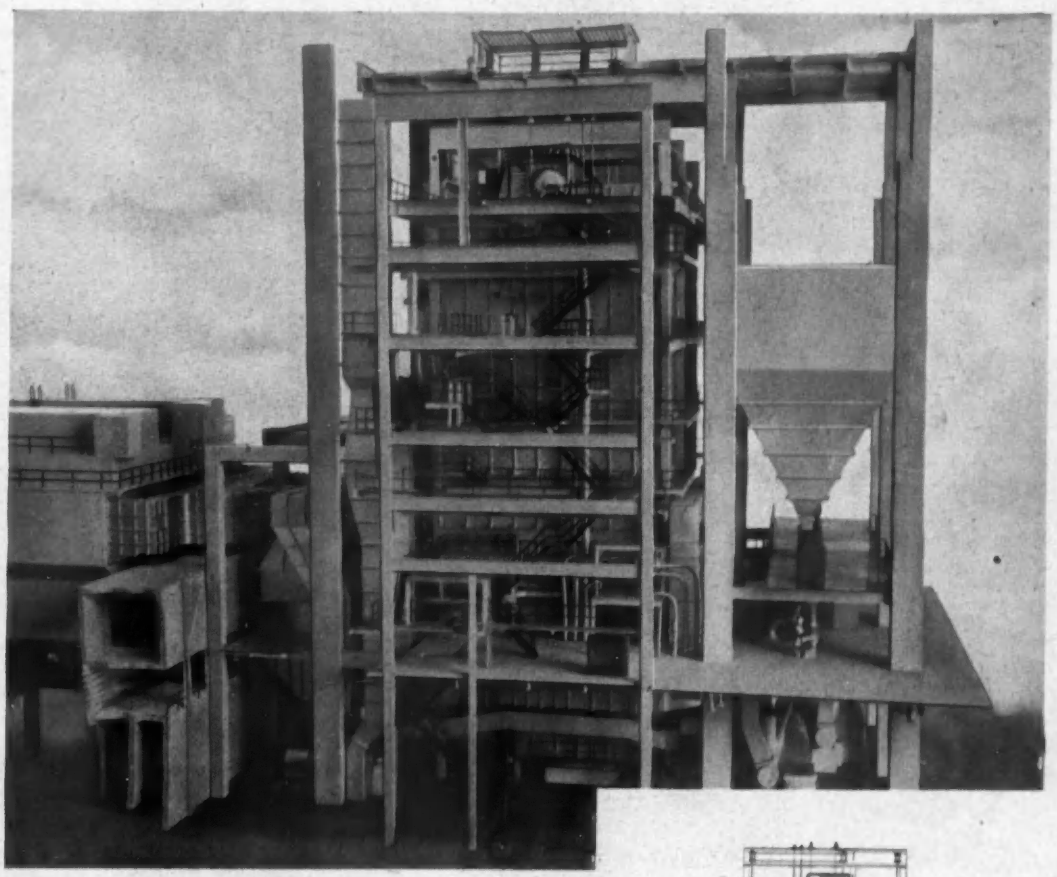

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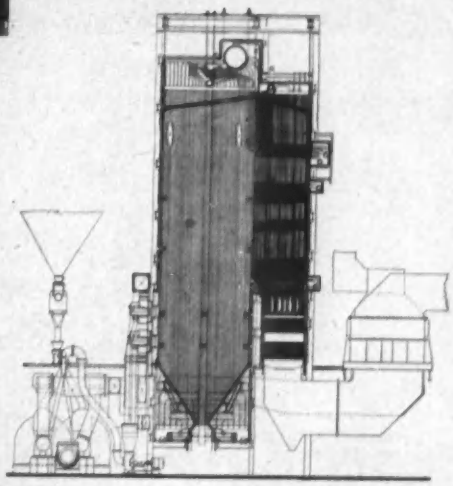

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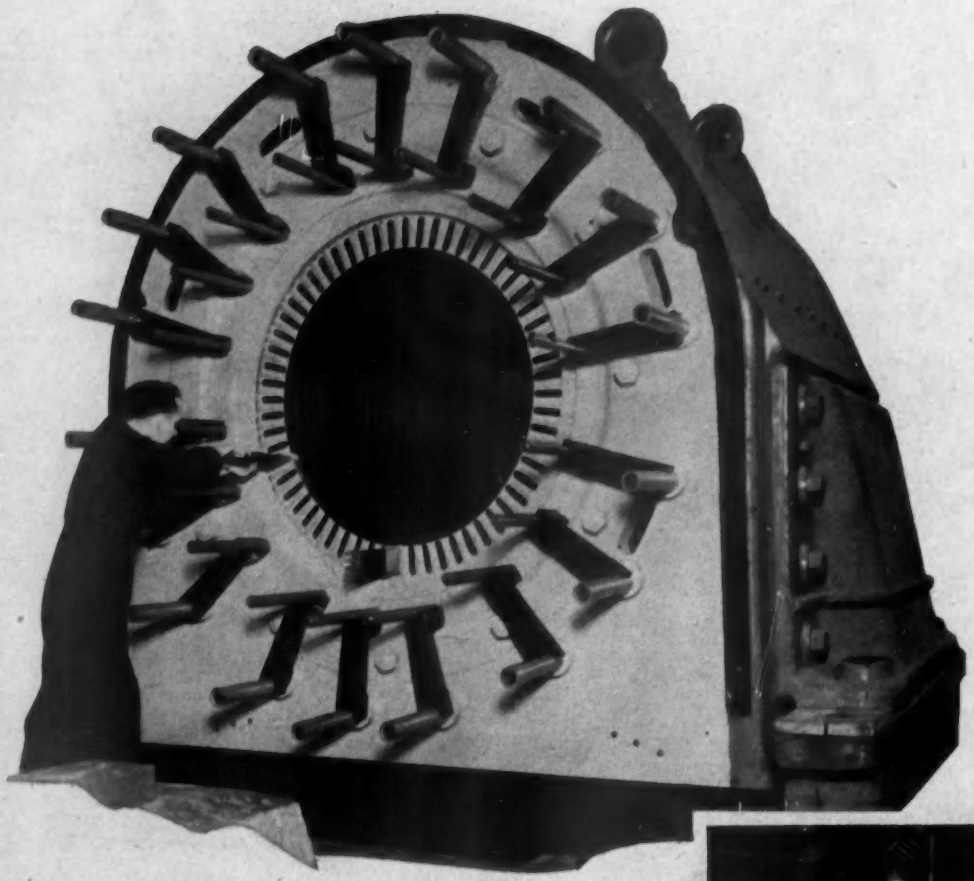

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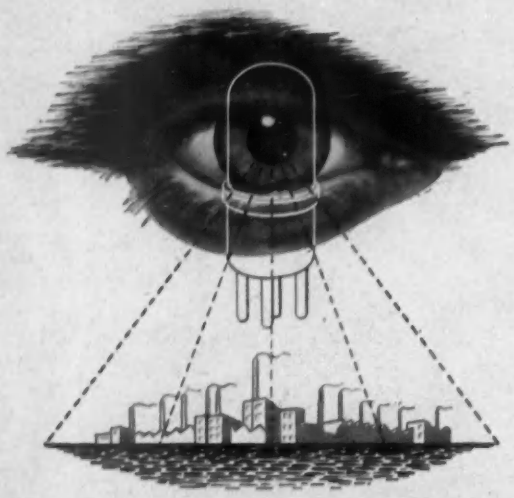

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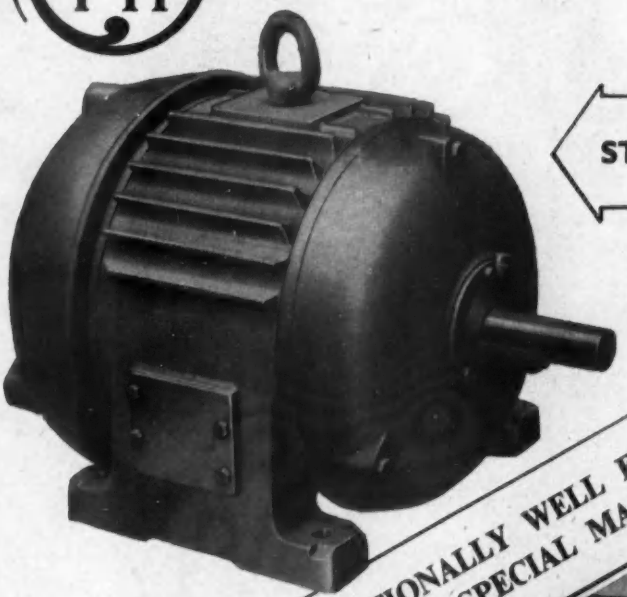

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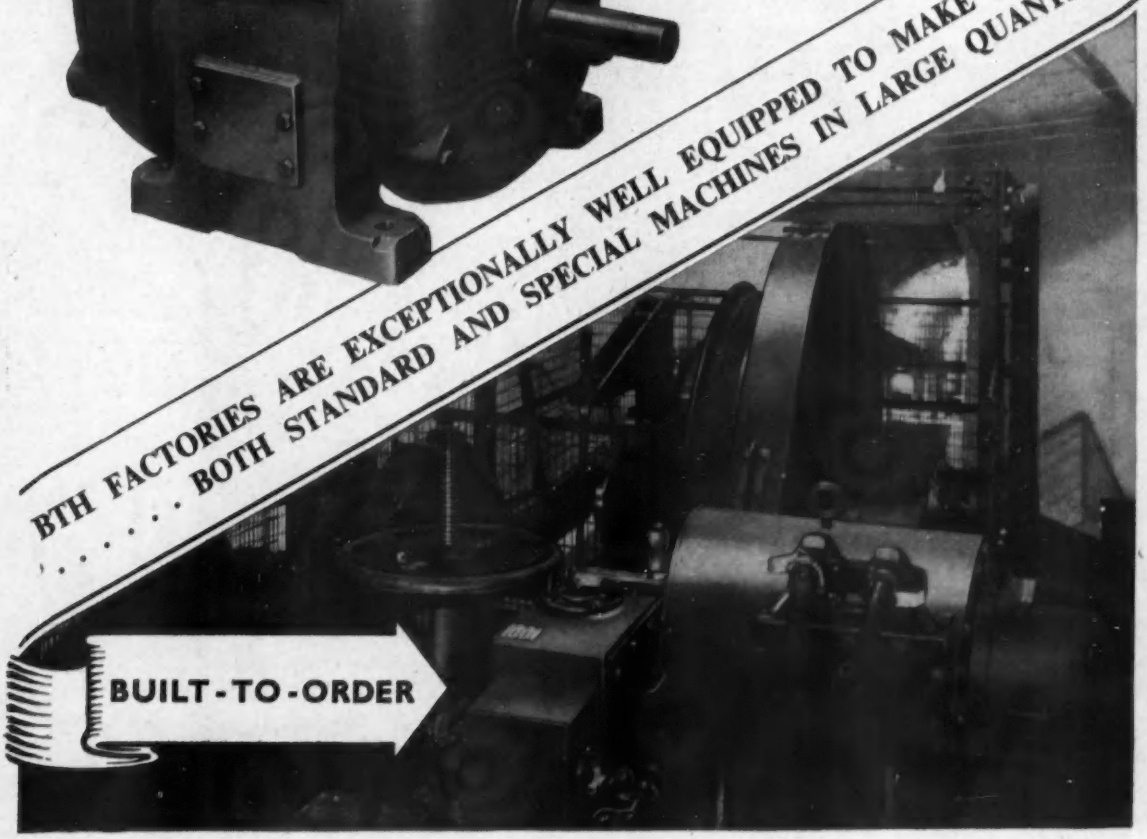

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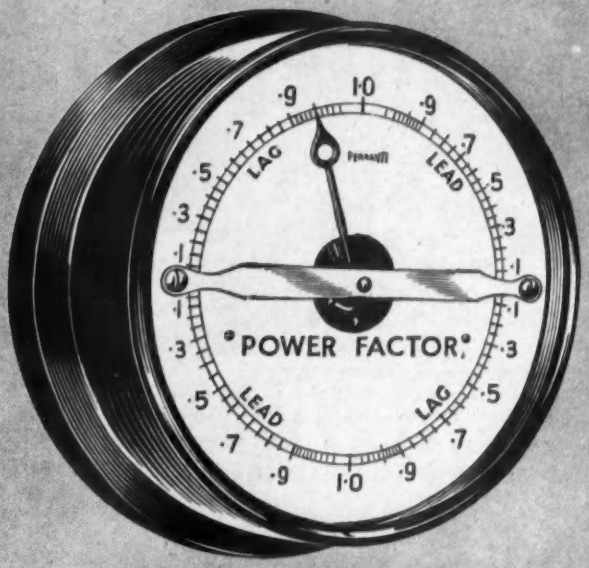
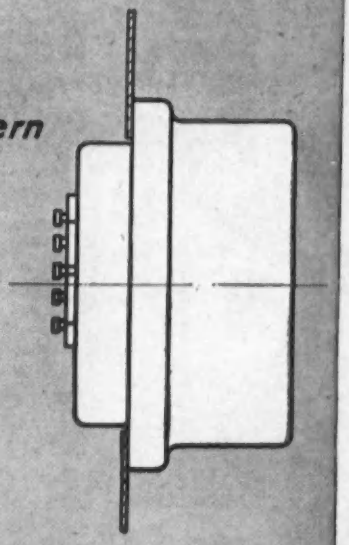


Round Pattern



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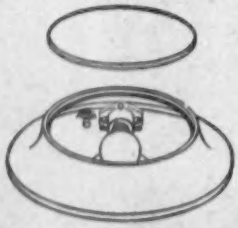
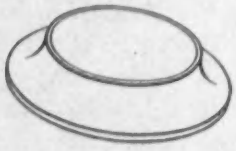


The* R.E.A.L. *Plinth Light



R.E.A.L. STANDARD PLINTH LIGHT
List No. 5000

Diameter at Top	8"	Price
Diameter at Base	11¼"	**36/9d.**
Overall Height	2⅞"	each.
To accommodate 15 watt, or 25 watt B.C. Lamp.		Tax Paid

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List No. 5002

Diameter at Top	5¼"	Price
Diameter at Base	6¼"	**28/-**
Overall Height	2⅛"	each.
To accommodate 15 watt B.C. Pygmy Lamp, or 25 watt B.C. Tubular Lamp.		Tax Paid.

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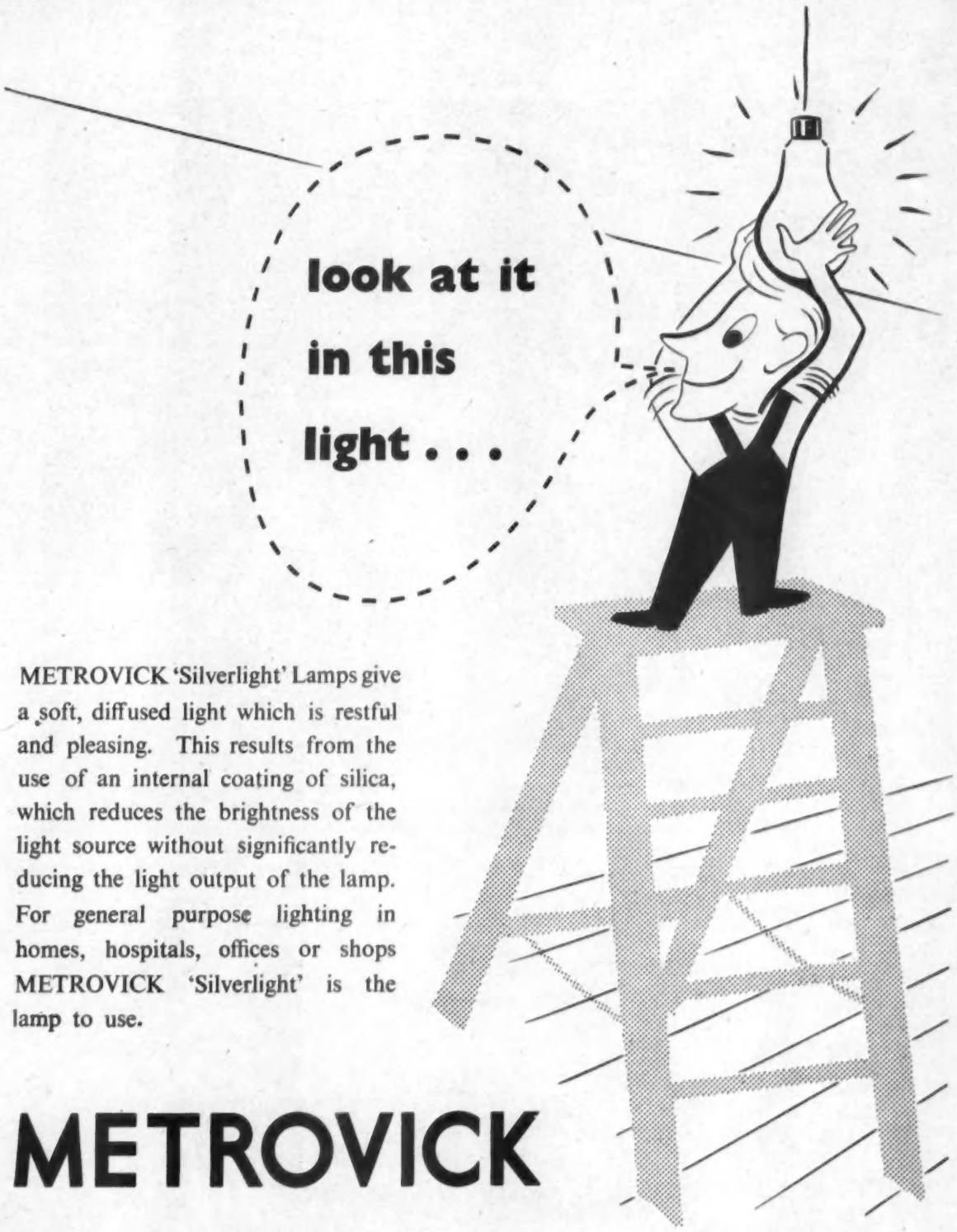

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It is a dry-type transformer designed for operation at the new 'Class H' insulation temperature rating which allows a 'hot spot' temperature of 180°C. Under normal operation the winding temperature may rise to 140°C above an ambient temperature of 40°C.

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WHAT ARE THE ADVANTAGES OF A CLASS H TRANSFORMER?

1. It is smaller in both size and weight than an equivalent Class B transformer.
2. It may be energised after standing in damp conditions because silicones make the insulation highly water repellent.
3. NO FIRE RISK. The danger of fire or explosion generally associated with transformer failures is, in practice, eliminated. Overload tests have shown that at temperatures approaching the melting point of copper, silicone-bonded insulation does not catch fire or produce sufficient decomposition products to be ignited by a spark within a sealed unit.
4. Due to their greater safety, Class H transformers provide a reliable and safe solution for site conditions which preclude the use of oil.

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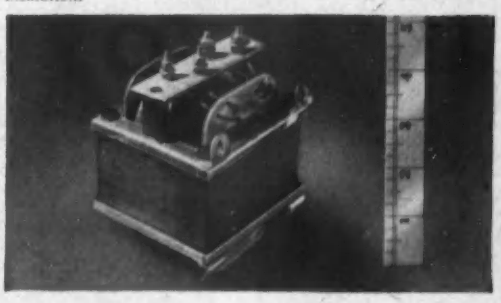

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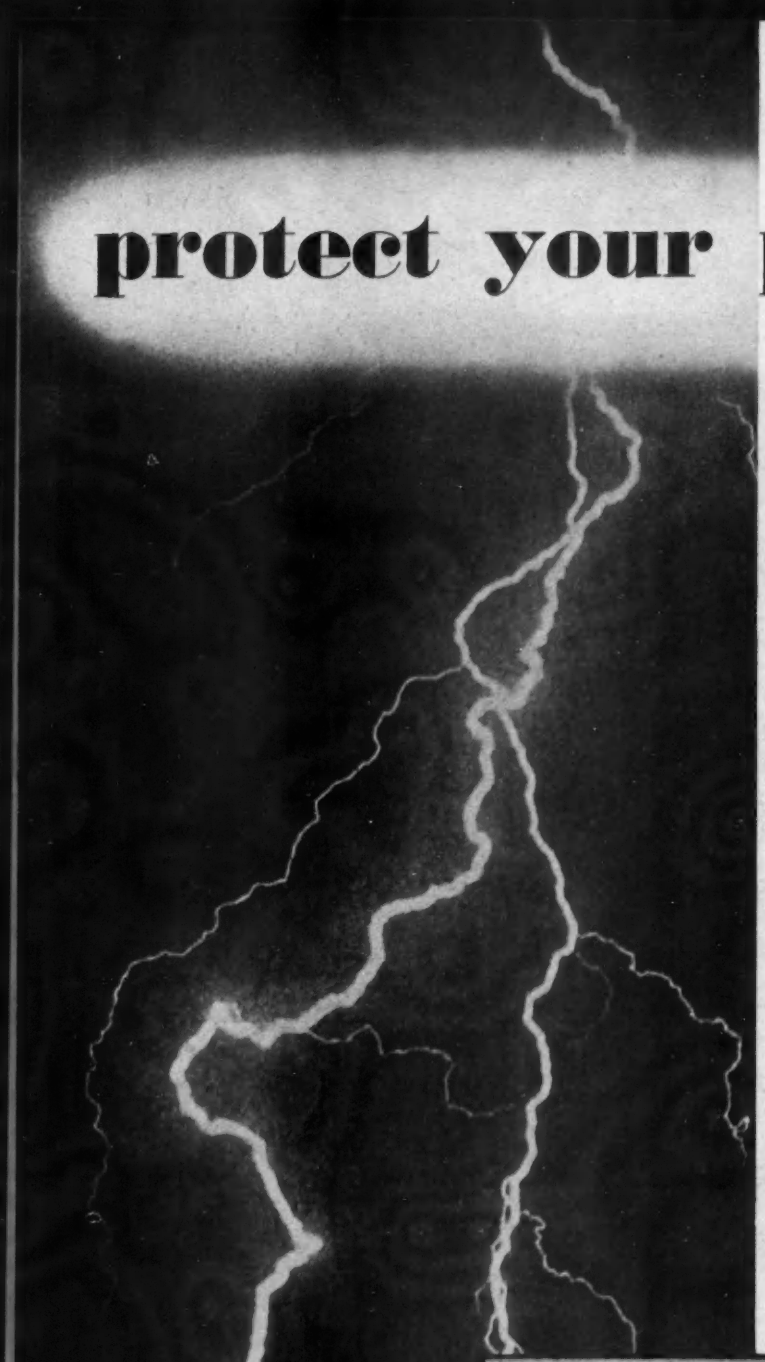

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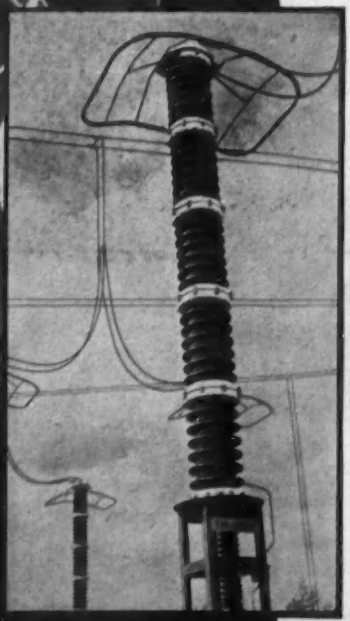

380kV Lightning Arrester type XRSC.

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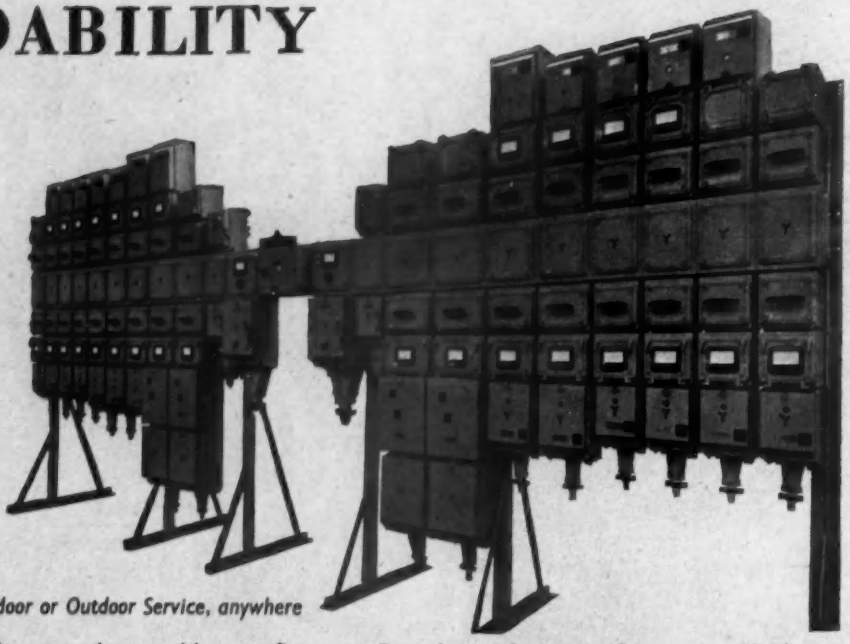

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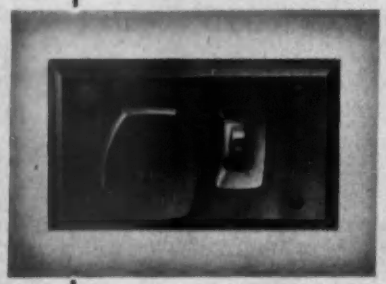

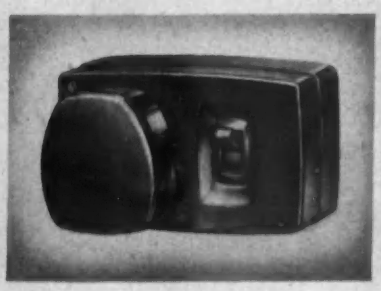

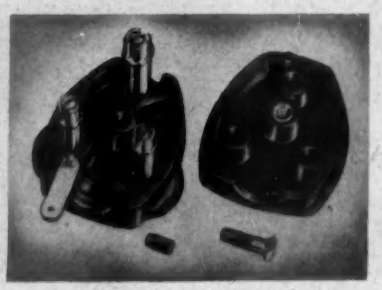

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★ Designed for easy wiring
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★ Neat, attractive, individually packed

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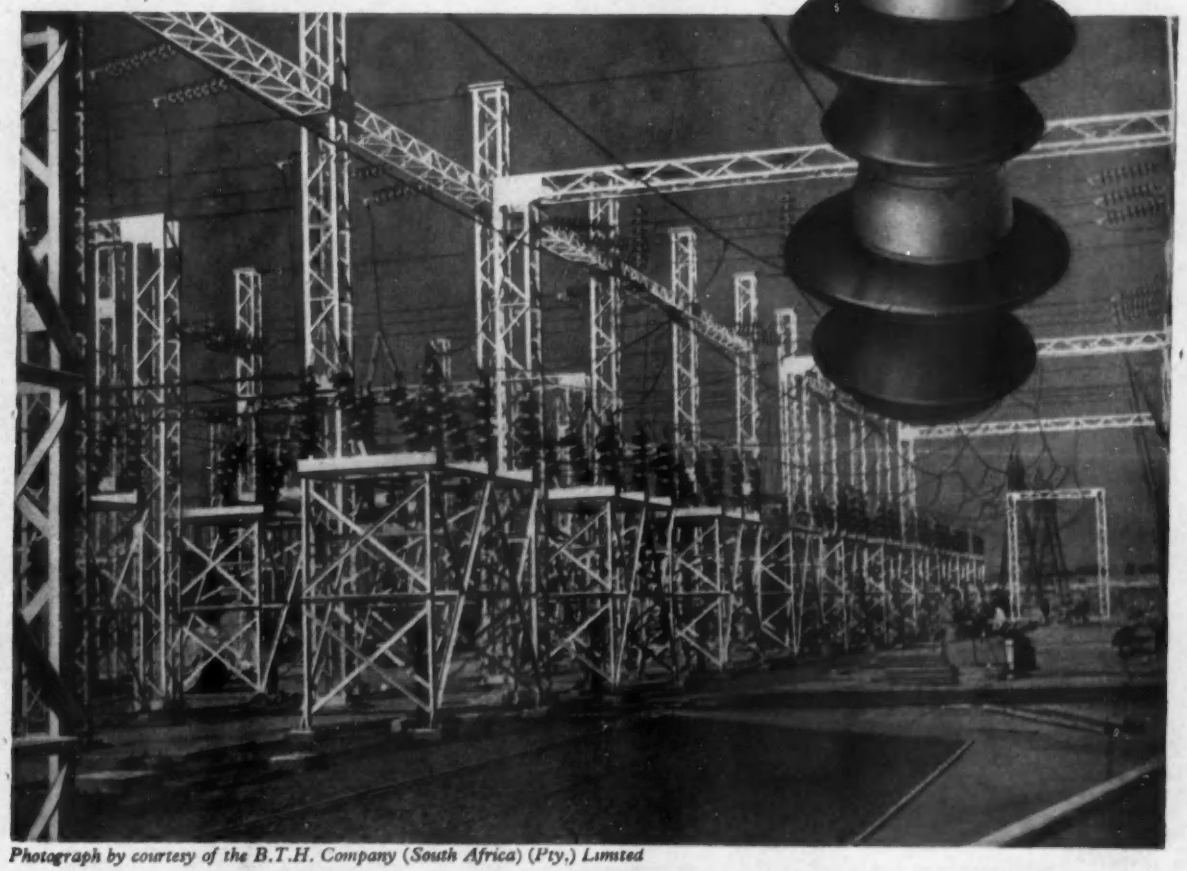

Photograph by courtesy of the B.T.H. Company (South Africa) (Pty.) Limited

The 88 kV. Switchyard at Vierfontein Power Station of the Electricity Supply Commission (Rand Undertaking) is one of many for this Authority insulated with S.P.P. Posts of 4-units P.642.

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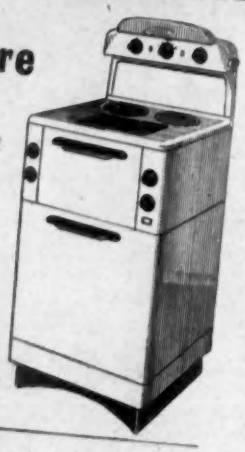

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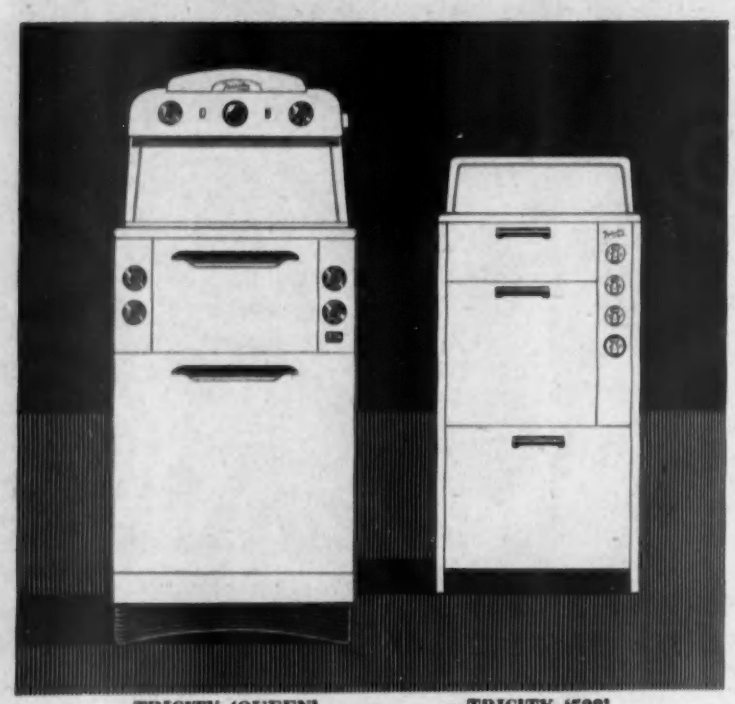

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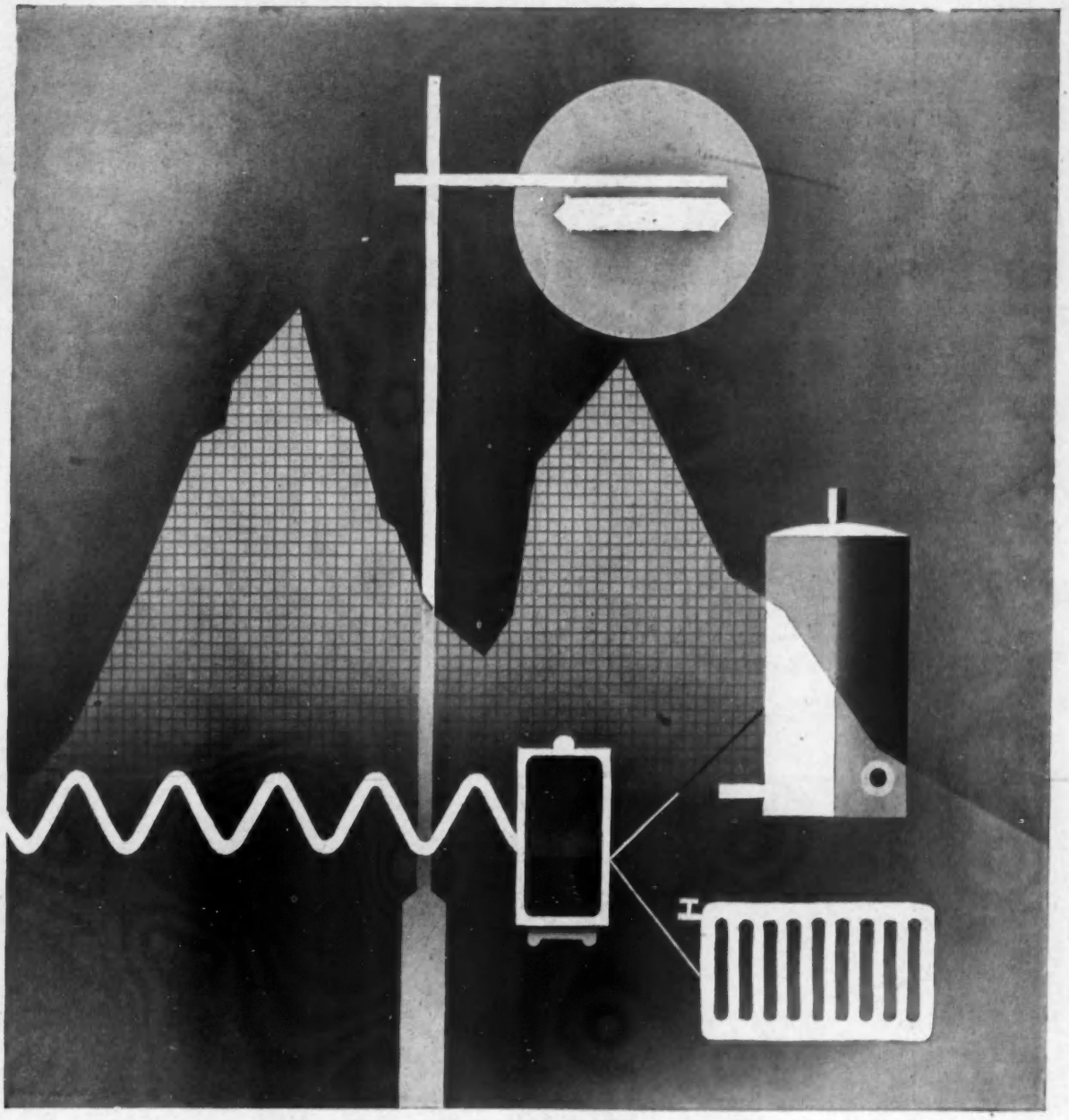

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The ample supplies of electricity now available could be utilized more cheaply if the load on the power stations were more evenly distributed throughout the 24 hours by eliminating the acute peak periods of short duration which at present occur. "Rythmatic" ripple control equipment enables this to be done. At the touch of a button water and space heating loads can be transferred from heavily loaded "peak" periods to lightly loaded periods. The consumer is not inconvenienced and the generating authority benefits from an improved load factor. The supply authority also benefits through being able to accept additional load—equal to the transferable load—for the same maximum demand charges.

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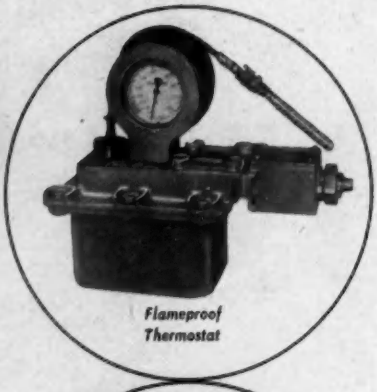
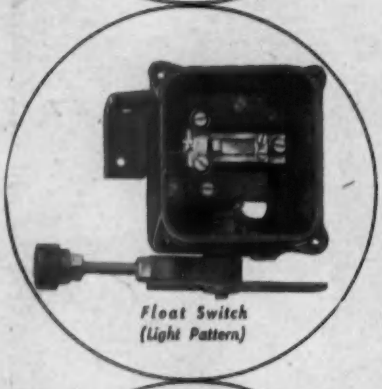
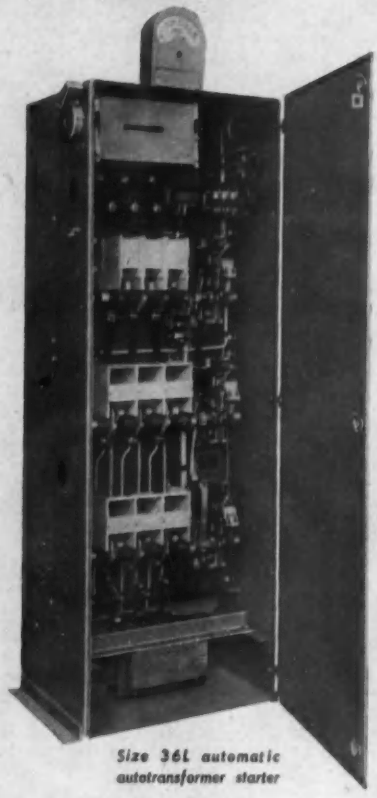


Flameproof Thermostat



Float Switch (Light Pattern)



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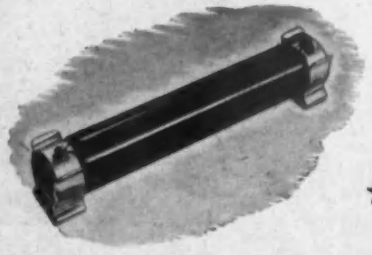
4 **Welded internal connections.**
Imperfect internal connections would cause intermittent changes in resistance value and faults difficult to locate.

5 **Enamel, tube and winding must be thoroughly annealed during firing.**
Internal stresses in materials would be revealed as cracks in the surface of the enamel, cracked tubes or open circuits due to mechanical fracture of the fine wires.



6 **Matched expansion coefficients of tube, wire and enamel.**
The big operating temperature range of vitreous resistors would cause cracks in the ceramic materials or breakage of winding if stresses were set up due to unbalanced expansion coefficients.

7 **The vitreous enamel must be chemically inert at temperatures up to 1,000°C.**
Enamels which have a chemical action on the wire at high temperatures would cause eventual open circuits.

★ ***These seven features are incorporated in all BERCO vitreous enamelled resistors which are manufactured in a wide range of sizes and mountings.***

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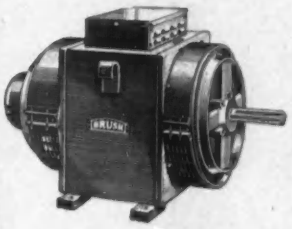
new BRUSH SQUARE PATH ALTERNATORS



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Highly efficient, easily maintained and competitively priced the new Brush Square Path Alternators are designed *exactly* to meet the needs of modern industry. They are built in a wide range of sizes with outputs from 1½ to 35 kVA, self regulating, self exciting. Compared with orthodox alternators with overhung exciters they have higher efficiency, lighter weight and smaller dimensions. Brush Engineers are specialists in designing self regulated alternators (1½ to 35 kVA) and externally regulated alternators (1½ to 32 kVA) as reliable components for generating sets. And all Brush built alternators can be bought complete with Control Switch Gear. Write today for our latest catalogue and publications.

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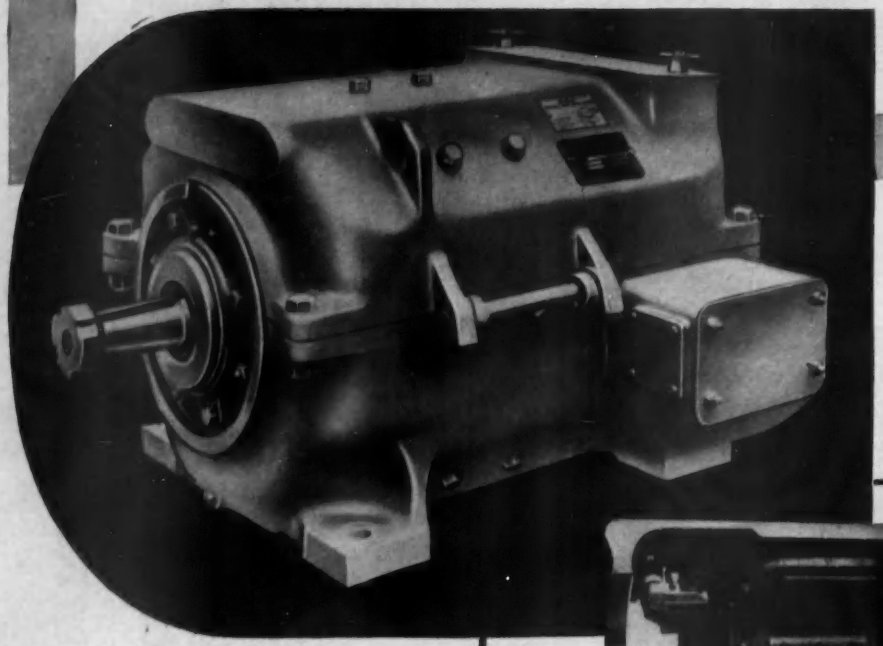
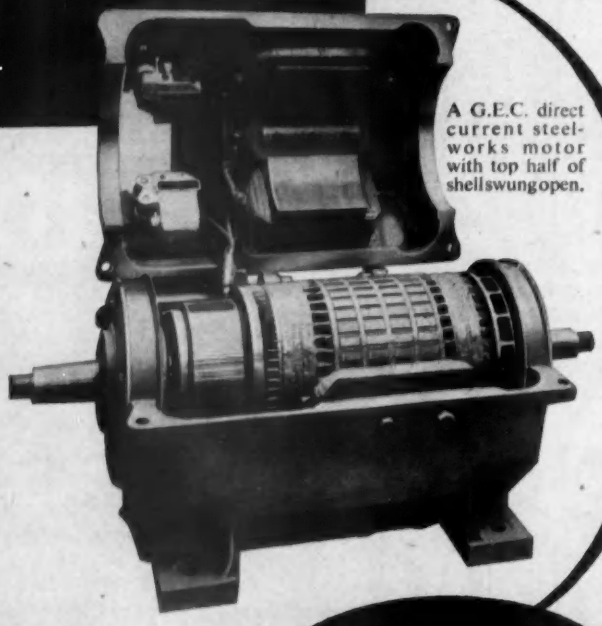


A typical G.E.C. direct current steelworks motor.



A G.E.C. direct current steelworks motor with top half of shell swung open.

G.E.C. steelworks motors are available from 5 h.p. to 200 h.p. and comply fully with the dimensions and ratings standardised by the American Association of Iron & Steel Electrical Engineers.

The motors are of extremely robust construction and are specially designed for quick starting, stopping and reversing.

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THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 10 FEBRUARY, 1955
Volume No. 127 Number 3301
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COMPETITIVE SPIRIT

It has always been our view that for success under nationalisation it is necessary to bring into the supply industry the friendly competition and rivalry of the past; of the days of the "point five" club and when low working costs were a stepping stone in the path to promotion. Today the industry has no yardstick, and local effort and achievement are lost in a maze of global statistics that make up consolidated profit and loss accounts. It was with the object of providing a means of assessing area board performance from published figures that Mr Bolton presented his analysis at the I.E.E. last week, but whatever may be the technical merits or demerits of the method he used, the proposal fails to meet the industry's need, since it concerned only the area boards themselves. To be effective any yardstick must measure down to local levels, to the districts where the effect of competitive spirit can become manifest. At present, the paucity of information on district performance is a complete ban to any attempt at comparison and the first step should be towards increasing the data available. Even with the facts to hand, however, it may not be possible to provide an exact mathematically determined order of merit, but given the necessary top level authority, a satisfactory method could be evolved intended primarily for the use of an independent panel which could make necessary allowances for local variations in assessing relative performance. And if the yardstick patently measured along the direction in which the industry should progress then it should be successful not only in stimulating efficiency but in building up the team spirit so necessary within the local unit. Already certain area boards and divisions are using the stimulus of competitive grading in limited fields of activity and are finding it an antidote to possible feelings of frustration of which much has been heard in the last seven years. What is needed, however, is both regional and national assessments of performance of the smallest local unit. It can be done if doubts are cast aside and the problem tackled with the same energy as devoted to technical advancement.

CONVENTION LOOKS AHEAD

Electricity and the future provide a theme broad enough to contain all the diverse interests now represented in the membership of the British Electrical Power Convention. The programme for next June's meeting, issued last week, shows that for this year at least, the encompassing of five largely different sessions within a single theme has entailed no

undue strain on the organisers. It suggests, too, that the Convention is developing into a public platform for informing the nation generally what are the achievements and the aims of the electrical industry rather than as in its earlier years, treating of matters of urgent concern to the delegates. This year, at least, there are several papers which are obviously not for the sole consumption of the delegates. The clearest example here is the session on "The Electrical Industry as a Career"; but something of the same "public relations" character attaches to Mr Eccles' promised ten-year forecast on "The Generation of Electricity in Britain" and to the symposium on "Electricity and the Industrial Future." The Convention may, indeed, be settling down to a triple task: providing a vehicle for publicity on electrical engineering in the broadest sense, a valuable rallying point when urgent problems confront the industry as a whole, and an informal meeting ground for those who perform differing tasks, but have a common electrical interest. Given this approach, the desirability of holding the Convention annually is apparent.

IDEAS NEARER HOME

When the British Productivity Council suggested exchanges of visits between local firms in this country, the idea had a reception far different from that accorded to the plan for tours of American industry. There was a fear of revealing trade secrets to home competitors, and the feeling that anyway each firm knew all about current British methods. Perseverance by the Council and its local committees has built up visit exchanges, however, and evolved the circuit scheme, whereby perhaps a dozen local firms plan a mutual interchange of visits by teams representing all levels and skills in the factory organisation. An interim judgment on the results obtained is attempted in the recently issued January bulletin of the British Productivity Council. This leaves little doubt that tangible advantages have resulted from the visits. Secrecy has presented little difficulty, largely because it is not so much detailed processes that have suggested to visitors the possibility of improvements in their own factories but rather such matters as planning systems, maintenance methods and handling equipment, which are common to many industries. As for the feeling that there was little fresh to learn, the circuit scheme seems to be reaffirming the adage that what is seen impresses far more than what is read.

LESSON FROM HOLLAND

In 1945, the railway system of the Netherlands presented a picture of nearly complete destruction and chaos. Within two years the whole system was back in operation and by 1953 an electrification programme covering some 525 miles of main lines had been undertaken and completed. Now further extensions of electrification and diesel working are in hand. Although external aid, particularly in the immediate post-war period, was provided, the greater part of the work of reconstruction had to be carried out by the Netherlands Railways organisation. That such a programme could be carried out successfully with the limited financial resources available at the time, was in itself a major achievement, and was only made possible by the full deployment of all the resources of modern engineering, and by the scrapping of expensive traditional methods of construction. The satisfactory result of this work has been that during the post-war period, the railway system has operated at a profit instead of as before the war, at a loss. The situation in Holland was admittedly not directly comparable with that now confronting the railway system of this country, but the record of achievement in rehabilitation of the Dutch railway system provokes the thought that British Railways may well have erred on the side of conservatism in setting a fifteen-year period for their first major main line electrification schemes. The recent statement by B.E.A.M.A. that the electrical industry is well able to undertake the demands made on it indicates that one of the restraining factors feared in the plan is no longer admissible. The example of Holland should go far to proving that other delaying factors, particularly in the civil and mechanical work, can be overcome.

INVENTORS ABSENT

One of the principal objects of the establishment of the National Research Development Corporation in 1948 was to give help to amateur inventors who lacked industrial connections. It was felt that full exploitation of the nation's inventive talent was being hampered by the lack of such support. In a review of five years of operation which accompanies their fifth report, published last week, the Corporation note that no successful inventions have come to them from outside the ranks of scientists and professional engineers. The imagined untapped reserves of ideas do not apparently exist.

CHANCE FOR STREET LIGHTING

The recently announced programme for the improvement of the road system of Great Britain was unfortunate in that it made no mention of street lighting. To obtain access to the main trunk ways which it is proposed to establish, the majority of vehicles must necessarily pass through built-up areas where peak hour suburban and long distance traffic must coincide, with, at present, consequent hold-up and expense. With the high traffic densities now being experienced in our towns, the contribution made by good night-time visibility is of increasing importance both in safety and in higher utilisation of the available road system. Yet it is just in these areas that the greater part of bad lighting occurs. Much of this is a direct consequence of the powers held by local authorities in connection with street lighting. Every motorist, particularly in London, must have at some time remarked on the astonishing variety of lighting systems and intensities encountered even over short distances. Yet despite all past efforts, the general situation indicates too slow a progress. It is now more vital than ever that action should be taken to establish consistently high standards of street lighting for at least all major throughways in urban areas, and with the present concentrated attention now being paid to difficulties of traffic congestion and transport a fine opportunity is available to attain this end.

Meteor

Oil from Groundnuts

ELECTRIC POWER USAGE IN A CONTINUOUS SOLVENT OIL EXTRACTION PLANT

IT is well known that the oil from groundnuts is used in the manufacture of margarine and cooking fat, but it is not so widely realised that the residue after the extraction of this edible oil provides two other valuable products. The British Extracting Co. Ltd.—one of the Unilever group of companies—have built a new continuous low temperature Solvent Extraction Plant which, after processing the groundnuts for the production of edible oil, produces either a top grade commercial meal suitable as a raw material for animal feeding stuffs, or a special technical meal suitable as a raw material for I.C.I. to make into "Ardil" protein fibre—a new fibre which is blended with natural and man-made fibres. This new mill at Bromborough Port, on the banks of the River Mersey, is the first of its kind in the United Kingdom and, besides dealing with groundnuts, it can also be used for the treatment of a wide variety of other vegetable oil seeds in the preparation of edible oil and technical and feeding meals. As the continuous solvent extraction process involves the use of a highly inflammable substance, hexane—a petroleum product which boils at a low temperature—elaborate precautions must be taken in the part of the plant devoted to this process and this naturally affects the electrical system.

To appreciate the significance of the electrical installation at the new works, a short description of the processing is given, commencing with the arrival of the raw material by ship at Bromborough. From the ship it is off-loaded into storage silos and conveyed by a belt system, as required, into the factory bins which provide the immediate storage function for factory requirements.

The groundnuts contain about 48% of extractable oil of excellent edible quality, used not only as an ingredient of margarine and cooking fat but also in several hundred other food products. Since the outer shell produces little of commercial value, practically all groundnuts brought by the United Africa Co.'s Palm Line to Bromborough Dock are ready-shelled or "decorticated," as they are known to the trade.

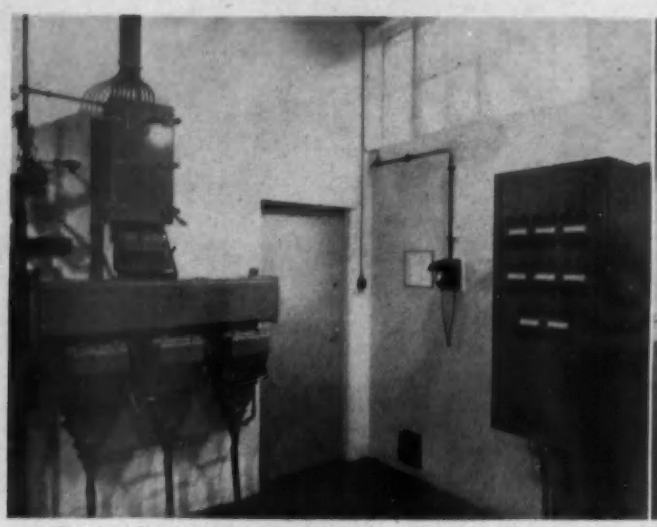
The heading photograph shows a view of the Bromborough factory

The kernel, or white part of the seed, is covered by a red skin which contains a substance with dyeing properties. The proportion of the seed destined for ultimate processing for the manufacture of "Ardil" fibre has, therefore, to have the skin removed. The kernels are then pressed to extract the oil, but the temperature has to be kept low to avoid damage to the protein. The technical meal for manufacture in "Ardil" protein fibre is all dispatched by rail to the I.C.I. "Ardil" factory at Dumfries. "Ardil" is sold in staple form like wool, which it closely resembles.

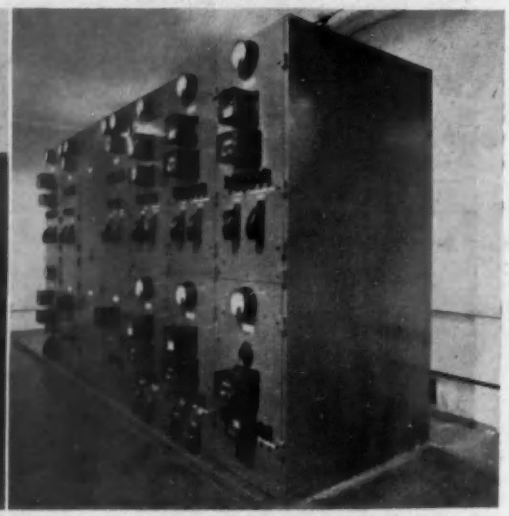
As the initial oil-extraction plant, which consists of specially designed expelling machines, is not capable of accepting seeds of greater size than would pass through an ¼ inch mesh, it is essential to pass the raw material through preparation "cracking" rolls, which also help to break down the fundamental internal cellular structure. To make the seed more amenable to the expelling plant, it is "cooked" before entry.

After expelling, the oil is filtered and transferred by pipeline to the despatching department for outward transit to other sections of the Unilever organisation. There is, however, between 15% and 20% of oil left in the residues from the parallel expelling process and this has to be dealt with by the solvent extraction method.

In this process, the residue, after preparation, which involves rolling and flaking, is fed into an endless bucket chain contained within a 40 ft high lagged vessel. The chain consists of 30 buckets of special design, each capable of accommodating 4 cwt of flaked meal, which is fed into the descending side of the chain. A mixture of hexane and oil derived from the second stage of the extraction process is injected into each bucket, and after dissolving part of the oil in the residue from the mechanical extraction plant, the liquid drops, via wire meshes in the bottom of the bucket, into the one below, ultimately falling into a compartment at the bottom of the cylinder whence it is piped off for distillation and separation. The ascending buckets, which now contain partially processed meal are similarly fed, but in this case with neat hexane, which removes almost all the remaining oil. This oil enriched solvent collects in a second base compartment and provides the mixture used for processing the incoming meal. The final residue is



The above fuse-switchgear is typical of others all round the factory. The door leads to the solvent extraction room



This 5-panel switchboard, housed in the extraction substation, controls all supplies to the continuous solvent extraction block

tipped into a discharge hopper, and after heating in a sealed drier to remove the residual hexane, goes on as dry extracted meal to the "Ardil" process in one case, or to animal feeding stuffs in the other. The hexane is returned into the process for reuse.

The meal in the drier provides the necessary sealing agency against the leakage of hexane to the grinding and despatch departments and, therefore, it is essential that the surface level of the drying meal should be maintained constant within close limits. An indication of the level inside the drier is provided by a gamma ray detector which provides a signal to the packaging monitor. This equipment controls the rate at which meal is extracted. Additional safety is provided by a capacitor probe device which shuts down the whole process in the event of a dangerously low level being reached.

The electrical load of the extraction plant consists almost entirely of motors of comparatively small ratings which are used for driving the expellers, conveyors and handling plant, pumps and ventilation fans. The largest motors used are two in the grinding department, each has a capacity of 65 h.p. Heating for the initial "cooking" of the seed and for the distillation columns is derived from a separate boiler house.

Loading and Power Supply

Some idea of the loading can be gained from the fact that the total nameplate h.p. of the plant motors is 2,115 h.p. spread over 371 machines. These include drives for boiler house auxiliaries and for the d.c. machines which are used for providing the requisite power for the electromagnetic separators. The majority of these motors were supplied by Lancashire Dynamo and Crypto Ltd. With such a heavy induction motor load, of which the greater part is taken by squirrel cage types, power factor correction is of importance and in this case is accomplished by the addition of the necessary condensers at the individual motor terminals. By this means it has been found practicable to hold the overall power factor of the plant at about 0·85 and it is interesting to note that despite the high nominal h.p. of the motors, the maximum demand is at present only 940 kW. This is partially because the plant is not yet operating at full capacity and is to a certain extent laid out for future expansion if necessary.

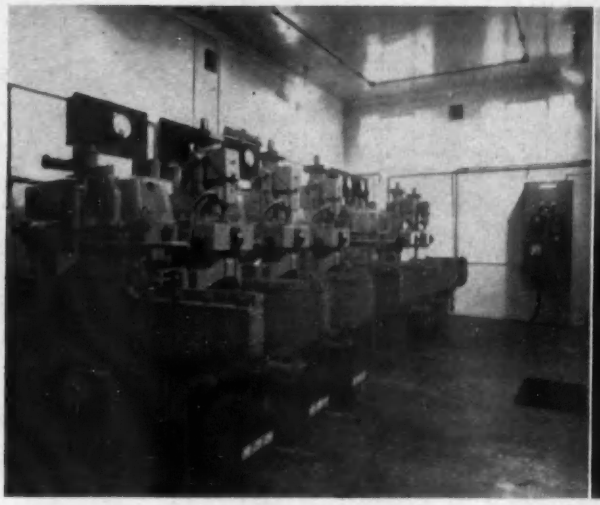
The extraction plant, as a whole, forms part of the industrial conurbation located round Port Sunlight, and in common with the rest of the factories draws its power from a central power station which is owned and operated by Lever Brothers, Port Sunlight, Limited, but is operated under instructions from the B.E.A. It is directly connected to both Birkenhead Substation and Bromborough Power Station.

From monkey nuts to fabrics. A feat of modern chemical processes

From the central power station, connection is made by an 11 kV 0·30 sq in. 3-core p.i.l.c. single wire armoured and served cable. This is at present operating at 6·6 kV and terminates in the extraction plant main substation, which also feeds the dock area. This substation contains seven English Electric Type OLD horizontal isolated metalclad switch panels, the oil circuit-breakers of which are rated at 250 MVA breaking capacity at 6·6 kV although they are suitable for operation at 11 kV with higher capacity (350 MVA). Normal current rating is 400 amperes. The reason for the use of 11 kV cables and switchgear is to allow for further extension of the plant, or a future establishment of an 11 kV system.

In the substation, supply is taken from the feeder via one of the switches to a local busbar, which in turn feeds the dock area via a second switch and the distribution busbar for the extraction plant via a bus coupling switch.

Four distribution circuit-breakers, of which three are at present in use, control supply to the plant. These three operating circuit-breakers are each connected on the output side to a 1,000 kVA transformer stepping down the voltage from 6·6 kV to 415 V. One of these three transformers

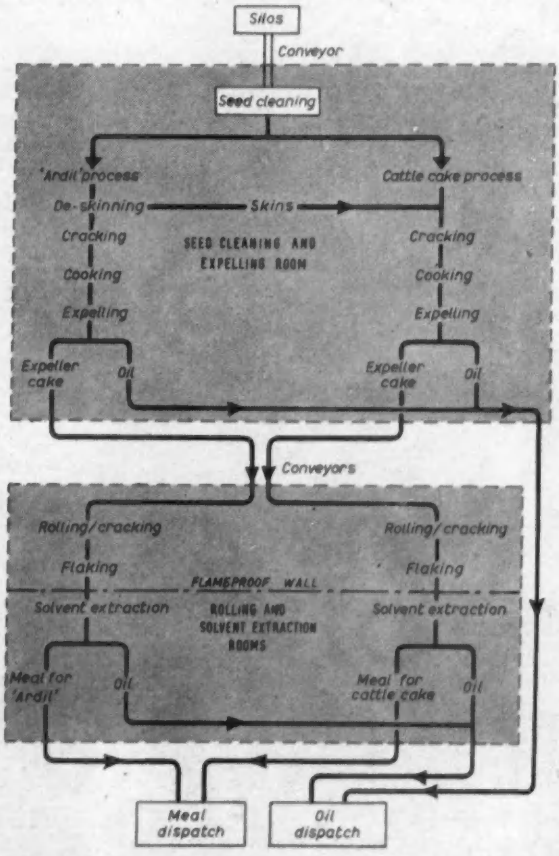


The switchgear illustrated above controls all the power required for the factory

These two switch fuse boards are housed in the solvent extraction block

provides the power for the solvent extraction block, while the other two provide supplies for the seed cleaning, expelling, flaking and other processes.

Provision has been made for future conversion of the transformers to 11 kV operation on the high voltage side. Connection between switchgear and transformers is by 0·2 sq in. 3-core underground cables.



The above flow diagram shows all the main processes in the factory

Metering of this section is carried out in the substation on the incoming side of the bus section switch and full protection is provided including overload and earth leakage through a definite minimum inverse time relay.

Distribution

The two transformers which supply the general plant, other than the solvent extraction section, are directly connected to an English Electric type OB3 double tier switchboard with air-break switchgear, which is located in the main substation in a section isolated by a partition wall from the 6·6 kV equipment. From this board, which comprises 10 units, distribution cables take 415 V supplies through 660 V grade underground cables to local boards situated in the factory. The solvent extraction plant, fed from the remaining transformer, has its own main switching equipment, located near the solvent extraction block itself. This equipment consists of five switch panels, type OB3, double tier, one of which controls the incoming supply, while two feed the two solvent extraction units, one the lighting and one the pump house.

All this primary distribution switchgear is rated at 1,600 amps at 415 V and has a rupturing capacity of 25 MVA at that voltage. Overall protection at the 415 V system is provided on these distribution panels, and includes restrictive earth leakage by means of an instantaneous relay, and in addition to normal overload, intertripping facilities have been provided on the transformer feed in panels, to ensure clearance of the appropriate 6·6 kV main circuit-breakers at the high-voltage substation. The 660 V cables connecting the transformers with the intermediate substation consist in the case of each transformer of seven 0·75 'sq in. p.i.l.c., which are arranged two per phase and one for the neutral.

The three substations, so far mentioned, are all contained within brick buildings and the L.C. substation, high-voltage room is fitted with CO_2 automatic fire protection. As a further precaution, all internal wiring—apart from the main supply cables—has been carried out using Pyrotenax mineral insulated cables. To avoid humidity and condensation, heating is provided by the use of tubular electric radiators with the usual rating of 80 W/ft.

Responsibility for maintenance is divided between the staff of The British Extracting Company and Lever Brothers, Port Sunlight, Limited. The latter organisation

being responsible for all substation switchgear and transformers while the former are responsible for all plant within the factory.

Seed Cleaning and Expelling

The first task of the plant before the process can start is the cleaning of the groundnuts and, when technical meal is being prepared, the removal of the fine red skins. This is inevitably a process productive of fine dust and consequently all electric motors in this part, as indeed throughout the whole of the plant, are of the totally enclosed type. There are in this section some 90 motors installed with a total nominal h.p. of 200. For motors up to 9 h.p. Ellison direct-on-line starters are provided, and for larger units star-delta starting by the same manufacturer is employed. Where a motor controls an important service, a local push-button and ammeter are provided in addition to those at the master control panel. This applies to motors which are operated by the sequence control system, more of which will be said later on.

Part of the seed-cleaning process naturally involves the removal of extraneous matter which may have been introduced during the shipping and handling in the transit period from Africa to Cheshire. Here one of the major dangers is the introduction of ferrous material, and the removal of all such particles is accomplished by the use of magnetic separators. D.C. supply for the magnets of these separators is derived from L.D.C. motor generator sets, each consisting of a 14 h.p. motor driving an 8½ kW d.c., 220 V generator. Each separator has its own individual control panel, and field control of the d.c. generators is available at these panels, to allow variation of the magnetic fields concerned. Normal full load current is 20 amps with a voltage across the separator of 220 d.c.

After cleaning, the kernels pass into the "cracking" rolls, which break them down to an acceptable size and are conveyed to "kettles" where the fragments are heated before going forward to the expellers.

The variation in quality of the seeds makes it essential that the expellers should have a variable drive and close control of speed has therefore been attained by the introduction of Schrage type motors at this stage. Four 50 h.p. units provide the necessary expeller drives, and each one has close-circuit forced-air circulation by means of integral fans. All cabling in these two preliminary sections is by means of Enfield p.i.l.c.s.w.a. types supported by B.I.C.C. cleats.

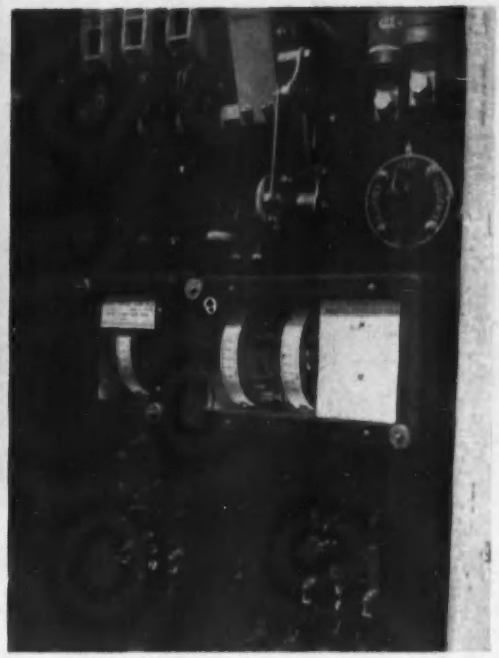
Subsidiary distribution switchgear is required in this section of the plant and consists of English Electric combination switch-fuse gear located conveniently with respect to the equipment it supplies. Provision has been made in these local boards for some 46 switch units which are of 300, 150 or 60 amp capacity as required by the duty. Lighting requirements are also taken off this system through E.E. fully shrouded, moulded, fuse-distribution panels which provide single-phase supplies, balanced across the three incoming phases. To simplify cost accounting within the general organisation, metering is carried out on all important services fed from this combination switch-fuse gear.

Solvent Extraction Plant

From the expelling plant, the residue called "expeller cake" is conveyed to the extraction block. This block is divided into two sections, the first of which is devoted to the preparation of the expeller cake for the solvent extraction process, and the second which is concerned with the actual solvent extraction. The preparation process consists of rolling the "expeller cake" to break it down to small dimensions and then passing it through flaking rolls which reduce the "cake" to flakes approximately ·020 in. to 0·25 in. thick and ¼ in. diameter. In such condition it is then suitable for feeding to the solvent extraction plant.

The two processes are housed within the extraction block, but are separated by a 14 in. thick "flameproof" wall due to the low flash point of the hexane which is used for solvent extraction. This dividing wall coincides with the division of the electrical equipment. In the rolling and flaking sections the installation is similar to that already described for the seed cleaning and expelling plant, but in the solvent extraction section special provision has been made to combat the difficulties presented by the presence

Left. Bagging the final meal. The sequence control panel for this stage of the operation is seen in the background
Right. A collection of motors mainly used for driving conveyors



General view of the Brookhirst sequence control panels above, and a close-up of the motor control panels associated with the sequence control system is seen on the right

of hexane. This highly inflammable liquid, closely allied to the volatile fractions of petroleum provides a fire-hazard of the greatest magnitude. Even tools used within this dangerous area are bronzed to avoid the possibility of sparking and all electrical equipment is either Buxton tested and certified, or intrinsically safe. Within this area there are no less than 56 motors with a total capacity h.p. of approximately 230. Cables are either 660 V C.M.A. grade p.i.l.c. single wire armoured or v.i.r.l.c. single wire armoured. The former being used where 415 V services are required and the latter for 250 V requirements. Push-button switches for the remote control of motors have been supplied by Belmos Ltd., and are in accordance with B.S. 229 for Groups I and II gases.

Control of lighting is taken outside the danger area by bringing the necessary cables through glands in the 14 in. thick barrier wall, and thus permitting all lighting switching to be performed externally. There is always a possibility of static build up on machinery and to obviate this all pipe-work, machinery and other equipment have been securely bonded to earth. Lightning, too, constitutes a further possible hazard, and a most elaborate arrangement of lightning conductors, securely bonded to each other by a series of straps running round the perimeter of the building, has been provided, together with independent and positive earthing. Provision has also been made for the periodic testing both of system continuity and also of earth resistance.

Fire Precautions

The solvent extraction block is a five-storied building of considerable area, and the emergency fire extinguishing plant is consequently large and comprehensive. Each of the five floors is covered by sixteen detector heads allied to 32 cylinders of methyl bromide which are distributed in groups of four around the inside wall of the building. The gas from each group is released through valves operated by solenoids rated at 36 V, 3 amp d.c.

The detector heads are connected electrically to a control unit located on the ground floor. At this station individual indication of operation on each of the five floors is provided, and further, a selector switch allows half of the detector heads to be isolated for test purposes. There are thus ten separate sections within the control equipment as far as detection is concerned. The control unit and detector heads operate from a 12 V d.c. power supply. A green light indicates that each section is working correctly and a red light, for each floor, lights up should one of the heads operate on that particular floor. A reset button allows the system to revert to normal after a signal of fire or fault has been registered. It is also possible to set the system for manual operation of gas release. Fourteen flameproof push-buttons are located on the outside walls of the extraction plant, one at each exit, and are protected by a cover marked "Gas." A further fourteen flameproof push-buttons within the protected area and similarly located enable the alarm sirens to be sounded by hand.

Power for the operation of the gas-release solenoids and the sirens is derived from a 36 V 120 amp d.c. power unit using "Exide Ironclad" lead-acid cells. A heavy contactor panel, located near to this unit and having suitable timing relays to enable the personnel to get clear prior to the discharge of gas, converts the detector head indications into solenoid operation. Arrangements are made for fire indication to be given both at the gatehouse and at the fire station.

Sequence Control

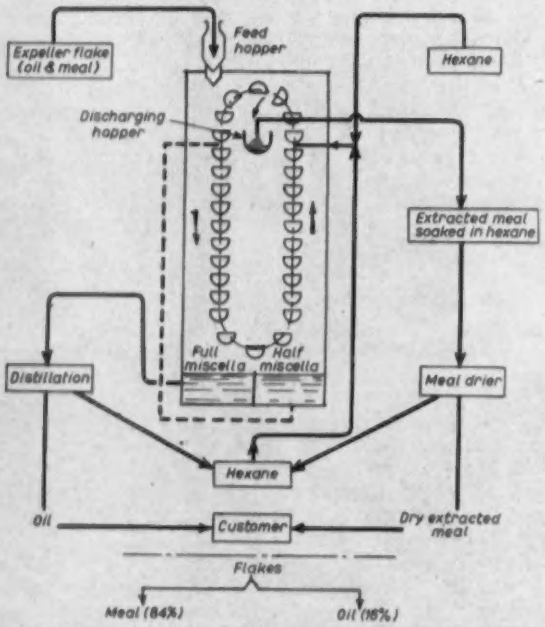
The process is designed to be continuous in operation and is normally only shut down for a few hours over the week-end. In view, therefore, of the importance of avoiding "piling up" in the event of a motor failure or machine break-down, sequence control of the system has been widely applied, separate systems being provided for the seed-cleaning and solvent extraction areas. However, the system is at its most comprehensive in the solvent extraction building where a Brookhirst master control panel for the whole of the plant has been installed. Each individual motor, both in the actual extraction section, has its own control panel which houses a P. & B. thermal overload relay, Brookhirst starting contactors, alarm relays and fuses together with an over-riding sequence control. Two indicator lamps are provided, one yellow, giving an early

Throughout the plant, main overhead cabling is by Enfields using B.I.C.C. cleats

warning of over-load conditions, followed by a red indication on trip-out. Under the latter condition the sequence control comes into operation and shuts down the plant sections before the faulty machine.

Maintenance

The maintenance problem of a continuous process plant which has to produce some 700 tons of oil and 800 tons of meal per week using no less than 371 motors with a variety of starters and elaborate control, is formidable. This devolves on The British Extracting Company's staff, under the control of Mr L. Roberts, Electrical Engineer. Ten men are permanently engaged in this duty. As far as motors are concerned, the majority are of the squirrel cage induction type, although there are some slip ring and some Schrage machines. The squirrel cage motors are inspected at three-weekly intervals, while weekly maintenance is carried out on the remainder. Each motor has its own individual record card on which its history is entered. Any necessary rewinds or major repairs are carried out by outside firms, but in view of the importance of continuity of production, spare replacement motors of all types are held ready for emergency.



Flow diagram of continuous solvent extraction process. Miscella is extracted oil and hexane mixed

Lighting is maintained on a planned schedule. With the exception of the boilerhouse and engineering shops which have fluorescent lighting and the roadways which have sodium lighting, the office and mill have tungsten lighting throughout.

Although the use of portable tools is confined to the maintenance staff and millwrights these are tested for earth continuity and insulation every fortnight, and, in accordance with the best safety practice, operate on either 25 or 50 V supplies derived from individual transformers.

Inventions and Application

PRINTED electrical circuits have attracted the interest of the National Research Development Corporation. This is stated in the Corporation's Report for the year ended 30th June, 1954, but no details of the project are given. The report notes that work on electronic digital computors continues to be the Corporation's largest single project. In this field, it is considered that British technologists are holding their own, despite greater expenditure in the United States.

Much of the report is devoted to a review of the work of the Corporation during its first five years of operation. The Corporation was concerned with three main tasks: to deal with the industrial property in publicly-owned patents, the responsibility for which had previously been included in that of Government Ministries; to encourage and facilitate liaison between centres of learning and research on the one hand and industry on the other; and to give support to inventors, particularly amateur inventors without industrial connections. The first task has effectively been covered, and the second is being dealt with slowly. On the final task, however, in spite of some successes, there has been no evidence that "a multiplicity of meritorious private inventors stand in need of public assistance." However, the Corporation does not concern itself with amateurs only, and it has sponsored inventions of professional engineers and scientists.

It is noticeable that seven of the eight substantial projects taken up by the Corporation have been in the field of light engineering and scientific instrument manufacture (the printed circuits project provides the exception). Only four of these rank as "private" (i.e. non Government department) inventions, the others having had some component of public initiative associated with them at some stage of their history. The Corporation concludes that outside the field of light engineering and instrument manufacture the isolated individual rarely appears to have any serious contribution to make to the advancement of technology.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

American Efficiencies

REFERENCE has been made recently in the correspondence columns of your journal, to the methods employed in this country and the U.S.A. for computing power station efficiencies.

The overall efficiency of a station is given by:

$$\eta_s = \frac{\text{Equivalent heat in electrical energy sent out}}{\text{Total heat input in fuel consumed}} \times 100\%$$

$$= \frac{3{,}412}{\text{lb fuel/kWh} \times \text{c.v. of fuel}} \times 100\%$$

where 3,412 is the heat equivalent in B.Th.U. of one kWh and c.v. is the higher calorific value of the fuel as fired.

This expression for station efficiency, and more particularly the use of the higher calorific value for the fuel, is generally accepted in both countries.

When comparing the efficiency figures quoted for stations having different steam conditions, it is useful to note that a 15% increase in the initial steam pressure produces a 1% increase in the overall efficiency, while for a reheat turbine, each 50°F rise in both inlet and reheat temperatures results in a further gain of something higher than 1%.

M. G. Nash,
LIVERPOOL.

Profits and State Industry

YOUR contributor, "Divisional Accountant," does well to refute the opinions of Alderman Bennett in your issue of 13th January. It is interesting to note that the Ford Motor Company has recently capitalised over £19 millions of reserves in a one-for-one issue of Ordinary shares. Two years ago this company declared a similar one-for-one issue by capitalising £9 millions of reserves. In other words they have increased their capital by four and a half times in a few years, this presumably as a charge on their customers. Thus this motor manufacturing company (and others) is doing precisely that which Alderman Bennett says they cannot do!

I do not propose to comment whether or not this is a healthy state of affairs, but I not think that the B.E.A. can be criticised unduly when their reserves total a mere £20 millions in comparison. The depreciation fund is also based on "historical" rather than "renewal" costs as in private industry, so that the B.E.A. is really running at a heavy capital loss and not a profit.

"B.E.A. Engineer."

Corrosion in Transformer Tanks

IN reply to Mr Gresley's comments on my article "Corrosion in Transformer Tanks" the fact remains that the trouble described has been experienced in the non-conservator type. My notes were not intended as a condemnation of the type, but as a reminder to maintenance engineers that a transformer may develop this trouble, and that internal examination when oil sampling is advisable. In B.S. 171, Amendment No. 4, periods for oil sampling are given which show the non-conservator type to require more frequent tests than the conservator type.

With regard to the loading of the transformer, quoted in my notes as operating under full load for considerable periods, the permissible sustained overload was seldom reached, and then only for very short times, the average output being at rated load with average ambient temperature 27°C. The substation was large and well ventilated, containing four transformers, 2 conservators, 2 non-conservator types. The oil acidity tests showed high values for the latter type, although installed much later than the former and running under similar conditions.

The fact that since modification to the sealing of the lid the corrosion has apparently ceased, with oil acidity remaining constant, points to poor sealing as the fault in this particular case.

In the second paragraph of his interesting comments, Mr Gresley states that "little or no trouble is due to acidity and corrosion." The word "little," however, does admit to some experience. It was the object of my article to relate an instance of such corrosion that had come to my notice, and to combine it with the advice, that there should be periodic examination to guard against this possibility.

T. H. Snelson,
BRIGHTON, 6.

Round of Rises

IN your Editorial "Round of Rises" in the 27th January, 1955, issue, you stated that, "In the result the average increase per head for the technical staff appears to be three times that obtained by the manual staff."

To me, this appears a grossly misleading statement and, unless the article be read in its entirety and by a diligent and informed reader it creates an impression which is contrary to the facts. And how many diligent readers are there today, in this age of half informed democratic clamour where ideas are nourished on political slogans and pictorial newspapers?

What are the figures on which you base your implication? Taking 1938 as a realistic datum line for each comparison, and dealing with people employed on, say, a 25/50 MW station, a fitter now receives 250% of his wages in 1938, his mate 268%, a turbine driver 272% and a labourer 267%. Other trades in the supply industry have received increases at similar rates.

On the other hand, the technical staff working in the same station, now receive 206% of their 1938 wage in the case of a shift charge engineer, whilst the station superintendent receives 192% of it, and these increases include the "sizeable rise" mentioned by you in your "Round of Rises" comment.

When these comparative rates of wage increases are studied, it should be clear that "the ratio of rate of pay and relative status current some years ago have not been restored." Consequently, it is hardly surprising that technical staff jobs on the B.E.A., which involve shift work or a seven-day week, have to be hawked around and attract but few bidders.

Incidentally, is this another reason why few University Graduates join the B.E.A. training scheme and why the wastage of such recruits is high when power station jobs are offered to them at the completion of their training period?

University Graduate.

[*The figures on which our calculations were based were the global sums allocated to the recent increases for manual, administrative and clerical, and technical staffs. As stated in our Editorial, the proportion of three to one applied only to the present "round of rises."—Ed.*]

Measuring Area Board Performance

ANALYSIS OF DISTRIBUTION COSTS CHECKS EFFICIENCY

MEASUREMENT of the commercial performance of an electricity board is a problem which has attracted much attention since nationalisation made available accounts on a uniform basis. The fundamental difficulty is that there are many factors affecting total costs which are quite outside a board's control. In a paper which was presented at an ordinary meeting of the Institution of Electrical Engineers on Thursday last, MR D. J. BOLTON, M.SC.(ENG.), M.I.E.E. (B.E.A.) makes an attempt to eliminate the effect of such non-controllable variables by substituting representative values. He obtains as a result, values for the departure from the country-wide average of each area board's economy of operation.

The author justifies his choice of variables in some detail; but in this summary, it is impossible to go deeply into his reasons. His first decision is that the basis of comparison must be costs per kWh, although this has several disadvantages. Costs which are not directly related to kWh are "loaded-on" to the kWh by appropriate multiplying factors. For instance, if the average consumer in a certain group costs the undertaking £2/year, additional to all costs related to kWh and demand kW, the consumer with a yearly consumption of 1,000 kWh/year is noted as incurring an additional cost of about 0·5d/kWh, and the consumer using 10,000 kWh/year as only 0·05d/kWh. In this way, the cost per kWh can be weighted by a component representing an appropriate share of consumer costs.

The author emphasises that his paper is concerned with *cost relating* on a functional basis, which he describes as expressing the cost per unit of service, such as kWh, demand kW or kVA, number of consumers, and area served. He distinguishes this from *cost classification*, which is the assembly and arrangement of cost on an accountancy basis; and *cost allocation* which is sharing the costs between consumers deemed to be responsible. Cost relating is based on answering the question: if the kWh (or other quantity) is increased by one, without any increase in the other quantities, by how much will the total cost increase?

1951-52 is the year examined in detail. In obtaining his figures, the author first of all examines fixed assets against maximum demand, and concludes that there is a fixed cost of £15/consumer (although £20/consumer is a result equally justified by the figures). He also arrives at an expression for the effect on capital costs of the physical size of the area served. In the result an expression is obtained

$$A = k_1 D + k_2 C$$

where A = first cost of assets at end of year, £.
D = simultaneous maximum demand at bulk supply points, kW.
C = number of consumers.
$k_2 = 15$.
$k_1 = 23{\cdot}60\sqrt{}$ (area/MW).

London has several special features, and an adjustment is made which increases values by 20%. The effect of load character, distribution voltage and power factor on capital costs/kWh are knowingly neglected, as of relatively small account.

An analysis of area board costs is now possible. These are split into a sub-total related to assets, another related directly to consumers, and a third which is common to all sections (rates, administration, etc.); in addition there is the actual bulk supply cost of electricity. An adjustment is made for activities other than the sale of electricity. It should be noted that the common costs are distributed *pro rata* to the other costs involved: 49% as energy-related, 38% as demand-related and 13% as consumer-related.

TABLE 1. SCHEDULE OF COSTS ON NATIONAL BASIS

	Energy-related	Demand-related	Consumer-related	Total
	£ x 10⁶	£ x 10⁶	£ x 10⁶	£ x 10⁶
Bulk-supply costs	117·35	52·86		170·21
Bulk-proportional costs ...		38·84	17·07	55·91
Directly consumer-related			13·17	13·17
Sub-total, directly related...	117·35	91·71	30·23	239·29
Common costs	7·69	5·96	2·04	15·69
Sub-total distribution ...	7·69	44·80	32·27	84·76
	d./kWh	d./kWh	d./kWh	d./kWh
Bulk-supply cost per/kWh purchased	0·514	0·231		0·745
Distribution loss on bulk supply cost	0·053	0·024		
Distribution expenditure per kWh sold	0·037	0·216	0·156	
Total distribution cost ...	0·090	0·240	0·156	0·486
Grand total—distribution and bulk supply costs ...	0·604	0·471	0·156	1·231

TABLE 2. CALCULATIONS FOR TWO AREA BOARDS

	London	South-Eastern
Energy-related:		
Bulk supply	0·583	0·587
Distribution loss on bulk supply ...	0·079	0·081
Common cost	0·037	0·037
Total	0·699	0·705
Demand-related:		
Bulk supply	0·268	0·234
Distribution loss on bulk supply ...	0·036	0·032
Distribution charges and common cost	0·296	0·211
Total	0·600	0·477
Consumer-related:		
Total	0·220	0·209

All values in d./kWh

The assets-proportional costs are allocated between demand-related and consumer-related classifications in the way indicated in the equation given earlier. Charges on assets are calculated at a rate of 8·227% per year, covering depreciation, interest, rents, insurance, repairs and maintenance.

Losses beyond the supply point are considered as energy related and demand related, an approximation being made for the latter figure by assuming it to be in proportion to energy losses. Finally, the effect of various types of consumer are investigated, because it undoubtedly costs more to supply an industrial consumer than a domestic consumer. However, the author reaches the conclusion that no special weighting is justified to allow for differing proportions of industrial, commercial and domestic consumers making up total numbers in the various boards.

Table 1 shows how these figures are broken down in terms of the 1951-52 national total. Totals on a functional basis are 0·604d./kWh sold to consumers, £7. 12s. 5d. per

TABLE 3. RESULTS FOR ALL AREA BOARDS, 1951-52

Area Board	Total cost and make-up of selling price						Distribution cost only			
	Energy-related	Demand-related	Consumer related	Discrepancy unaccounted for	Net surplus	Selling price	Energy-related	Demand related	Consumer related	Total related
	d./kWh $\times 10^{-2}$	d./kWh $\times 10^{-2}$	d./kWh $\times 10^{-2}$	d./kWh $\times 10^{-2}$	d./kWh $\times 10^{-2}$	d./kWh $\times 10^{-2}$	d./kWh $\times 10^{-2}$	d./kWh $\times 10^{-2}$	d./kWh $\times 10^{-2}$	d./kWh $10\times^{-2}$
L.	69·9	60·0	22·0	5·0	2·5	159·4	11·6	33·2	22·0	66·8
S.E.	70·5	47·7	20·9	6·9	−0·9	145·1	11·8	24·3	20·9	57·0
S.	68·8	49·8	18·9	7·5	0·5	145·5	10·2	26·2	18·9	55·3
S.W.	65·3	55·6	22·8	7·4	−2·3	148·8	10·8	31·2	22·8	64·8
E.	68·8	48·0	17·9	3·8	0·7	139·2	10·7	25·1	17·9	53·7
E.M.	54·5	49·2	15·6	−0·7	−5·2	113·4	9·4	25·7	15·6	50·7
M.	58·5	44·9	11·8	−1·9	−2·4	110·9	7·7	21·4	11·8	40·9
S.Ws.	48·2	37·2	9·3	−0·7	2·6	96·6	6·8	18·9	9·3	35·0
M. and N.Ws. ...	60·6	41·8	13·0	−0·4	0·8	115·8	8·7	21·3	13·0	43·0
Y.	52·7	42·9	13·5	−4·8	−0·9	103·4	7·3	20·0	13·5	40·8
N.E.	53·4	41·9	13·6	−1·2	−1·2	106·5	8·5	22·0	13·6	44·1
N.W.	58·3	44·8	13·4	−1·9	0·9	115·5	8·3	21·2	13·4	42·9
S.E.S.	59·5	54·7	18·5	−9·1	−2·6	121·0	9·2	29·5	18·5	57·2
S.W.S.	60·3	50·6	15·3	−10·4	−4·3	111·5	7·7	25·5	15·3	48·5
Total	60·4	47·1	15·6		−0·6	122·5	9·0	24·0	15·6	48·6

year per kW of bulk supply and £2. 7s. 9½d. per year per consumer. Table 2 shows the resulting calculations for two area boards: Here certain costs from Table 1 are brought in, notably the common cost, in proportion, and the values for average cost per consumer per year.

The results obtained for all boards are shown in Table 3. It will be noticed that there is a column headed "discrepancy unaccounted for". In effect, the calculations presented by the author have compensated for all the variations in selling price—a range of 65%—except for discrepancies of a very few per cent. These discrepancies show a certain uniformity. All the excesses are in the south of England, while the short-falls are in the Midlands and the North. Discrepancy figures for more recent years are given in Table 4. In Table 5 are the corresponding figures extracted to show the change from year to year. This shows that in general the discrepancies are lessening.

Conclusions

The discrepancy can be interpreted in two ways. It may indicate a shortcoming in the costing technique. This applies when a definite trend is apparent, such as the geographical trend already remarked on. Secondly, a positive discrepancy may indicate a bad mark for the electricity board concerned. However, when figures for successive years are available, many variables that confuse results may be eliminated. For example, a change to a smaller positive figure or a larger negative one indicates that the board in question has improved its economic efficiency relative to the other boards. It is claimed by the author that the discrepancy is "a very sensitive index to the specific or essential economic efficiency."

To sum up, it is claimed that the average costs for the country have been split into functionally-related components, and from this has been calculated what each area board's costs would be if similar functional relationships were maintained. However, the overall results do not in any sense say what electricity ought to cost.

DISCUSSION

MR C. T. MELLING (E.E.B.) thought that the author's approach to the problem of measuring the efficiency of the industry was a good attempt. It did not, however, give the full answer. The fact that only 13 effective sets of data available (London being a special case) itself prevented this. Then there was the difficulty that consumer service could not be measured statistically, although it had a big effect on area board working. It was probably an historical effect, that consumers in the south of the country demanded more and better service from the boards than those in the north. To take an overall view, if an examination were made of the tasks that an area board was required by statute to carry out, it would be seen that the economic aspect was not the only one by which the result could be judged.

Mr Melling criticised in particular the author's correction for the effect of area, contrasting boards with a large area, but big stretches of uninhabited moorland and mountain; and those with a thinly but evenly spread population. He also questioned the author's assumption that size had no effect on costs.

MR T. G. N. HALDANE (Merz and McLellan) expressed his belief that the paper was the first successful attempt to obtain an estimation of distribution costs in the area boards. It was the more valuable because the author had faced up to his

TABLE 4. BOARDS IN ORDER OF "DISCREPANCY"

1951–52		1953–54	
S.W. Scotland ...	−1040	S.W. Scotland ...	−644
S.E. Scotland ...	−913	S.E. Scotland ...	−644
Yorks	−480	Yorks	−431
N. West ...	−193	N. East	−198
Midlands ...	−187	Midlands ...	−90
N. East... ...	−120	E. Midlands ...	−40
S. Wales ...	−69	N. Western ...	−22
E. Midlands ...	−68	Merseyside ...	10
Merseyside ...	−38	Eastern	18
Eastern ...	378	S. Wales ...	137
S. Eastern ...	691	S. East	163
S. Western ...	735	South	381
Southern ...	752	S. West... ...	629
London		London	

All discrepancies in ten-thousandths of a penny

TABLE 5. TWO YEAR CHANGES IN "DISCREPANCIES"

	1951 to 1952	1952 to 1953	Total
S. Eastern	−139	−389	−528
Southern	−147	−224	−371
Eastern	−159	−201	−360
S. Western... ...	− 42	− 64	−106
N. Eastern	− 67	− 11	− 78
E. Midlands... ...	− 52	80	28
Merseyside... ...	167	−119	48
Yorks	−114	163	49
Midlands	95	2	97
London	119	− 7	112
N. Western ...	109	62	171
S. Wales	− 14	220	206
S.E. Scotland ...	149	120	269
S.W. Scotland ...	52	344	396

All discrepancies in ten-thousandths of a penny

difficulties and not claimed too much. He thought that the geographical effect brought out in the paper had to be regarded as something real. The discrepancies involved were becoming smaller as time went on, and this suggested historical causes connected with the organisation of the industry.

MR D. P. SAYERS (M.E.B.) disagreed with the philosophy of the paper. In particular, he did not accept that load factor and sales per consumer were out of a board's control. Future results would depend very largely on the efforts of the industry today. Results obtained by averaging the costs of services were inevitably misleading, since in many of the prevesting undertakings, such costs were written off, whereas in others they remained on the books.

MR G. O. MCLEAN (S.W.E.B.) considered that the results of fourteen area boards were insufficient for analysis. He put forward an efficiency formula based on a one-in-three sample of all undertakings in 1937. It was

$$\eta = \frac{P[1{\cdot}8\,C+(0{\cdot}27\,D+0{\cdot}027\,I)/240]}{\text{Actual costs (£)}}$$

When P is a population factor (a 20% variation), C is the number of consumers, D the total of non industrial units sold, and I the number of industrial units. He showed that this formula gave an order of efficiency quite different from that advanced by Mr Bolton.

DR F. T. CHAPMAN (S.E.E. Cons. Council) thought that figures calculated by the author's methods would show many changes in the next few years. During the first few years of nationalisation there was inevitably a levelling-up which was costly to some boards.

MR R. F. RICHARDSON (B.E.A.) questioned whether there was any relationship between demand-related costs and the efficiency of a board. He suggested that there was a correlation between the author's discrepancy and the deviation of individual boards from the average change in load factor.

MR G. T. T. RHEAM (Associated Portland Cement) considered that the author was mistaken in neglecting the ratio of domestic to industrial consumers and the load factor. If consumer-related costs were to be expressed in terms of d/kWh, then they needed to be reduced to a common load factor.

MR P. SCHILLER (B.E.A.) suggested a rearrangement of the author's figures with the object of avoiding the need to reduce to d/kWh. He thought that £15/consumer was too low; the figure should be far higher. He also felt that bulk supply costs should have been excluded from all calculations.

MR E. J. WHITCHER (L.E.B.) disagreed with most of the author's methods. Statistical methods, he said, suggested that the only way to improve the position of the L.E.B. was to move it up north; in practice, to move heavy industry south. He showed that the gas boards had a north/south break up of costs similar to the electricity boards.

MR S. F. OSBORNE (S.E.E.B.) emphasised that load factor and sales per consumer were by no means out of the control of boards. He also noted that the author's capital figures assumed uniform accounting practices, which did not yet exist.

MR R. BALDWIN (ELECTRICAL TIMES) referred to work published in 1951 which found a ratio between the effective costs of industrial and non-industrial consumers equivalent to 18:1 for 1951-52, rather than the 3:1·5:1 postulated by the author for industrial, commercial and domestic units. There was a sharp division in costs between the Eastern and East Midlands when the boards were arranged in their usual order. He felt that not enough attention had been given by the author to the effect of different proportions of various types of consumer.

MR F. H. DENNIS (B.E.A.) thought that it was misleading to suggest that there could not be economics of scale. In the earlier days of nationalisation such economics were masked by the backlog of work that had to be carried out.

The Author replied briefly, saying that most of the criticisms of his paper were answered when differences between years were considered rather than absolute values.

Recruitment discussed at S. Midland Centre's Dinner

SUCH is the present shortage of scientific and engineering students that it was not surprising that last Friday's Annual Dinner of the I.E.E. South Midland Centre adopted education as its main theme. Moreover, that the dinner took place in a city, Birmingham, which can congratulate itself on having a thriving university, and, that the Vice-Chancellor of that University was numbered among the speakers are two further factors likely to have influenced the choice of subject for the after dinner speeches.

In the opening speech of the evening, proposing "The City of Birmingham," the Chairman of the South Midland Centre, Mr A. R. Blandford, M.I.E.E., initiated the topic by pointing out that, today, more students were reading history than engineering, which was seen as a grave position in the light of the serious dearth of engineering students.. In trying to solve the problem of attracting more students to technical colleges and university engineering departments, the question must be asked whether classical subjects offer more to the students. Alternatively, were universities not doing their best in engineering subjects? He felt that the core of the problem was not to be found in these two aspects, but in the fact that the approach to students was not made early enough in their scholastic career, and that greater emphasis must be given to physical subjects in schools.

In a humorous reply which gave an insight into the daily round of a city's leading citizen, the Lord Mayor of Birmingham, Ald. J. R. Balmer, J.P., appealed for more consideration for old and historic buildings, some of which, he felt, were being demolished unnecessarily.

It was pleasant to hear, in the toast to the Institution of Electrical Engineers, Sir Edward Boyle, BT., M.P., Parliamentary Private Secretary to the Ministry of Supply, pay warm tribute to the high standards associated with the electrical industry. He saw them playing a key part in both our economic future and in defence. In a tacit reference to the importance of education, he pointed out that, at occasions such as the Farnborough Air Show, people were coming from abroad to take advantage of the technology of British industry. Such technical knowledge, he stressed, was going to stand us in good stead, especially in the manufacture of quality products. Referring to the electrical industry specifically, he expressed his confidence in the ability of the industry to rise to the demands to be made upon it by the electrification of the railways.

In reply, Mr W. K. Brasher, C.B.E., M.A., M.I.E.E., expressed the disappointment of all that a painful indisposition had prevented the President, Mr J. Eccles, from attending. In competently filling the breach, Mr Brasher reviewed the present position of the Institution, pointing out that the recent revision of the educational standards were made by the Council in consideration for the needs of electrical engineers when, in mid-career, they would be bearing heavy responsibility.

Senior Vice-Chairman of the Centre, Mr H. S. Davidson, T.D., M.I.E.E., ably acquitted himself of the task of proposing the toast "The Guests and Kindred Associations," extending a warm welcome to all visitors. Replying, Dr R. Aitken, Vice-Chancellor of Birmingham University, assured his audience of the sensitiveness of the University of the need for recruits to the profession, and of their willingness to train the right kind of electrical engineer if they received the boys from schools. He closed by urging those present to establish personal contact with as many boys of from 12 to 17 years as possible, and then to "exert a benign influence for electrical engineering."

notes on wiring

by Megohm

ELECTRICITY, like fire, can be a good servant but, if not properly used and controlled, it can prove a dangerous master. The need for planned methods of installation and good workmanship has long been recognised and all kinds of regulations, recommendations, codes of practice, etc., have been issued to assist in this. Some of these are mandatory and can be enforced by law, others are merely recommendations. Under the Housing Acts of 1949 and 1954, electrical wiring, lighting and water heating are included in the work which can qualify for grants for modernising old house. Information is given in the handbook *New Homes for Old, Improvements and Conversions,* published by H.M.S.O. for the Ministry of Housing and Local Government, which was reviewed in the ELECTRICAL TIMES on 13th January, 1955.

Electrical Installations

I am not very much impressed by the information given for electrical installations in this handbook. It is stated that existing installations should be examined and reported on by a *competent electrician* and the proposals for bringing the installation up to the required standard, or for a complete new installation, should be discussed with the local electricity board. It can then be determined whether a supply can be made available on acceptable terms, and the amount of the service connection charge, if any. Conversion work will mean new work, and this may also be required in works of improvement. The grants for such works come from public funds and I, therefore, feel that some higher authority than the electricity board should be responsible for passing the installation as being in order. For, not stipulating that the installation be inspected *after completion, by a competent engineer,* the authorities rely on the usual test, etc., carried out by the local electricity board at the time of connection. As many of us know, such a test does not reveal the bad practices of a certain class of contractor.

In such conversion and modernisation work the architect claims the lion's share of the money available and it is the electrical installation which suffers first of all. In many cases the money set aside for electrical work is, to put it mildly, ridiculous. I feel in such cases the architect counts the number of points, etc., required and then calculates the cost by doubling that number. Contractors have told me of instances where the provisional sum allowed in the tender was so small that it was impossible to do the work. One contractor gave an architect an estimate for the work *before* the building tender was prepared and when the work was due to begin found that the architect had decided the figure was too high and had reduced it to such a degree that all the sockets had to be omitted. I am, therefore, rather concerned that the opportunity to correct such bad practice has not been taken when preparing this handbook.

I am pleased to note that a warning is given about the matter of too few outlets being provided. This has always been one of my pleas to those in charge of installation work. It is stressed that if too few sockets are provided, tenants may use improvised and unsafe methods of connection, such as the indiscriminate use of socket adaptors, etc. The tragic results of improvised and unsafe methods of connection have been already shown in print officially. Again, there is a Code of Practice which assists in the matter of socket-outlets, but this appears to be ignored by the majority of architects and housing authorities. Although fires, washing machines and refrigerators are not eligible for a grant, I feel that certain of them will be contemplated by tenants of a house which has been modernised, and due provision should be made in the wiring.

The handbook draws attention to the advantages of the "all-purpose fused-plug type" of socket and to the saving in first cost which can be achieved by its use on the ring circuit system. This coupled with the warning about too few sockets should have some effect on the planners.

I should like to have seen some illustrations of this outlet, and the method of wiring the circuit, included in the handbook. I feel certain that the E.D.A. would have been only too pleased to oblige. I realise that much information on this subject is available to planners, but every opportunity should be taken to place it in front of them.

Building Work

In the conversion and modernisation of old houses, the architect will, no doubt, make use of the latest types of internal partitioning. The electrical contractor will, therefore, have to be up to date in his method of installing the various types of wiring in order to achieve a satisfactory result. Bad fixing methods and inferior material used in the electrical installation can ruin a first class building job. Close co-operation with the builder is therefore essential and this can only be achieved by the architect taking notice of this constant plea for more consideration to the electrical installation. Where possible, the controlling switches, etc., should be re-sited in accessible positions. As much of the wiring as possible should be concealed, but concealed in such a manner that it can be renewed, if required, at some future date. Now it has been proved that m.i.c.c. cables can be installed at almost the same cost as b.e. conduit and cable there should be an opportunity of providing an almost everlasting installation. Coupled with the possibility of non-interference by the amateur wireman, this cable would appear to be ideal for conversion work.

In conclusion, I would like to express my feeling that, under this Act, we in the electrical industry may be given an ideal opportunity to get rid of a substantial amount of bad wiring. Many of the old houses in this country have electrical installations which are, to say the least, in bad condition. It is in the interests of everyone that we press the various matters I have commented on above. In a matter of weeks we shall be making tracks for the Electrical Exhibition at Earls Court, and I hope that many architects will take the opportunity of examining the products of the electrical industry. I hope that contractors, engineers, etc., will encourage architects to pay a visit to the exhibition.

Explosion and Corrosion

TWIN PROBLEMS FOR THE INDUSTRIAL LIGHTING ENGINEER

LIGHTING in chemical works and similar establishments has to be arranged in the face of two special restrictions. The risk of explosion in some sections of the works means that ordinary industrial type fittings may not be used, while the release of chemicals into the atmosphere increases the degree of corrosion to which lighting fittings and associated electrical gear is exposed. British practice for dealing with these difficulties is reviewed in a paper which was presented to the Illuminating Engineering Society on Tuesday last. Its title is "The Lighting of Hazardous and Corrosive Locations in Industrial Plants" and the authors, Mr A. G. Palmer, B.SC.(ENG.), A.M.I.MECH.E., A.M.INST.GAS.E. (North Thames Gas Board) and Dr W. E. Harper, B.SC.(ENG.), PH.D., A.M.I.E.E. (I.C.I.)

The authors straightway take the point that failure to supply adequate illumination will itself introduce extra hazards. Thus a balance has to be struck between the need for lighting and extra dangers introduced. For many purposes flameproof fittings must be used. This may apply even if the area concerned is normally free from any dangerous gas or vapour, for the appropriate Electricity Regulation under the Factory Act covers the *possibility* of danger and not only its actual presence. In the opinion of the authors, it is difficult to achieve really good lighting when flameproof fittings have to be mounted at heights of 15 to 20 ft. One reason for this is the limited light output of single units, and the difficulty of using lamps of higher rating than 300 W if fittings are not to exceed the prescribed surface temperature of 50° C. It is felt that permitted temperatures might correspond more closely to the ignition temperatures of the gases involved.

Another criticism of f.p. fittings is the general absence of light control. It seems that there may be advantages in an inner toughened glass and an outer acrylic cover, the latter acting as a diffusing fitting. High cost, considerable weight and relatively low light output limit the use of f.p. fluorescent lamp fittings in this country.

Alternatives to Flameproofing

An alternative to flameproofing is pressurising in which entry of the inflammable vapour is prevented by maintaining a positive pressure within the system. Air at a few inches of water pressure is supplied to fittings through the electrical conduit or, preferably, through an independent piping system. With well-constructed fittings, the rate of air leakage from fittings has been found to be quite low. Some difficulty may be met with internal corrosion of the fittings, and in one plant where nitrogen is available from a process, this is used for pressurising.

Finally, hazardous areas may be illuminated from outside the danger zone. Lamps may be mounted high up, where a dangerous concentration of vapour is unlikely. Alternatively, they may shine through sealed roof-lights. In one outdoor chemical plant where operations are centred on a control room, lighting for maintenance inspection and movement is provided by a cluster of 500 W floodlights mounted on a 30 ft tower.

The explosive nature of dusts in certain concentrations is now well recognised. There is no British Standard setting out tests for dust-tight equipment, and some fittings described as dust-tight have proved ineffective in service. The authors consider as urgent the need for such a standard; experience has shown that effective dust-tight fittings can be produced. Performance tests, they suggest, might involve measurement of the rate of leakage of air when a fitting is pressurised to a few inches of water. When dust is present, the use of ordinary fittings mounted outside the danger area may prove ineffective because of high light absorption. In one steelworks tests showed an absorption of about 50% in a distance of 50 ft. Where dust is a danger, care must be taken to avoid the use of non-safety type portable lighting during maintenance operations.

Explosive manufacture, of course, involves very special hazards, and often lighting has to be installed outside the buildings involved. An example of the lengths to which it may be necessary to go is given by the use of flameproof floodlights mounted on the protective mound surrounding the building, with their beams trained on stainless steel plates from which light was reflected to the required spot. This gave 20 lm/ft² against the 1 lm/ft² previously available with wall mounted f.p. fittings.

Corrosion

Turning to corrosion problems, the authors point out that although metallic corrosion is the most serious form of chemical attack, the plastics now used in lighting fittings are also attacked by certain chemicals. Solvent attacks on acrylic and other plastics may produce the fine but sometimes deep cracks known as "crazing," and these may lead to a considerable fall in mechanical strength. There is no complete protection against this form of chemical attack, although annealing may help. If it is likely to occur owing to the presence of solvents, ethenoid plastics components must not be used.

Sheet metal fittings are rarely satisfactory in highly corrosive locations. Cast components are preferred, and some aluminium alloys in particular are found to have a good resistance to corrosion. In the authors' opinion glass or acrylic refractors are preferable to specular reflectors, as their optical efficiency is relatively unlikely to be degraded by chemical attack. In such circumstances, there is no entirely satisfactory specular reflecting material. With diffuse reflectors the problem is easier to solve.

Corrosion may be limited by special paint processes, or by flame spraying with coatings of polythene, and by good detail design. The latter includes eliminating crevices and ledges where corrosives may be trapped and the use of adhesives where possible in places of screws. In any case, mounting of lamps where access for maintenance is easy should be recognised as a first requirement.

Specific problems which the paper suggests should be investigated are: (i) The safe temperature of fittings used in locations where Groups II and III gases are present. (ii) The resistance to crazing of acrylic and other ethenoid plastics in the presence of Group II gases and vapours. (iii) The effectiveness of pressurised systems for lighting hazardous locations, particularly where Group IV and non-scheduled gases are present. (iv) The design of, and tests on, dust-tight fittings, ready for the preparation of a British Standard.

(v) Chemical resistance of various finishes for fittings. (vi) Properties of gasket materials. (vii) The use of epoxide cements for fitting assembly, and their behaviour at high temperatures.

Factory Electrical Measurements

USE OF ELECTRONIC EQUIPMENT BRINGS NEW METHODS OF HIGH ACCURACY

SINCE 1940, the introduction of electronic techniques has made possible the development of methods of carrying out common electrical and magnetic measurements in power engineering which are substantially changed from pre-war ideas. How far this change has gone was indicated last week by the paper presented by Mr D. Edmundson, B.SC.(ENG.), M.I.E.E., to the I.E.E. Measurements Section, which reviewed the field of electrical measurements in a single industrial organisation. It is important, moreover, to bear in mind that the methods were developed for and by the firm's testing department, with the corresponding need for practicability, whilst all are employed under factory conditions, and some used by unskilled operators.

Basically, all instruments employ some form of electronic amplification, which without correction introduces a degree of distortion due to amplifier non-linearity. However, in handling measurements of frequency or speed, amplifier distortion is seldom harmful. The amplitude, phase or waveform of the output is immaterial, whilst no amplifier, however non-linear, is likely to alter signal frequency. In all other measurements, sufficient negative feed back is employed to render the measurement largely independent of valve characteristics or supply voltage. Another feature of the measurements as a whole is the use of the Carpenter polarized relay, adopted after some experiments with various home-made designs. Apart from a paper in 1947, little has been written about the convenience and versatility of this sensitive relay, which is not only capable of operating at frequencies up to 500 c/s, but may be made to act as a mechanical rectifier, inverter or capacitor charge equally successfully.

Measuring Electrical Quantities

The first consideration in the use of these methods is the measurement of such commonplace electrical quantities as current voltage and power. Although a wide range of highly accurate a.c. instruments is available for this purpose, there are still many applications where their use presents difficulties, even at power frequencies. Apart from the essential condition that these instruments shall not disturb the system being measured, there is the further requirement of negligible power consumption by the instruments—a condition difficult of obtaining when measurements of the consumption of such appliances as small motors and lamps is being determined.

In such power measurements, the use of an electronic amplifier to supply voltmeters and wattmeter voltage coils provides a means of completely surmounting the above drawbacks, and is capable, in certain cases, of giving enhanced accuracy. The chief advantage of the amplifier in this usage, apart from its high impedance input, is that its "load" on the system has negligible effect on the current flowing, the power for the instrument being provided by a separate source.

An amplifier circuit, capable of universal application, has been developed, initially to carry out magnetic measurements. Broadly described as an amplified cathode-follower, it comprises a two-stage, direct-coupled amplifier feeding a valve in whose cathode circuit the wattmeter moving coil is connected. Feedback to the input valve cathode effects an accuracy of about 0·1%. It can be designed for inputs of 1 V upwards, although at greater than 10 V an input potential divider is desirable. Its immediate use is that of light power measurement, covering a range (say) of 0·3 to 30,000 W, but it is particularly attractive for measuring power at low power factors. Here, a backing off mutual inductance is employed to enable an input voltage close to unity to be fed into the amplifier.

Speed and Frequency Measurements

Where measurements of speed and frequency are to be made, the use of a tacho-generator introduces other factors to limit accuracy. If, however, an instrument is used to measure the frequency, rather than the voltage, of an a.c. tacho-generator, a number of these factors cease to influence the measurement. Such is the basis of instruments developed for measuring these two quantities.

They all derive from Maxwell's commutator bridge, which was employed to measure, in electromagnetic units, the capacitance of a capacitor in terms of known resistance and frequency. It employed the principle that a succession of impulsive currents obtaining by charging the capacitor, C, n times per second, produced a mean value in an m.c. galvanometer of the same value as a resistor R, where $R = 1/nC$—(circuit resistance measured from the capacitor terminals). The capacitor and charging device were therefore placed in one arm of a Wheatstone bridge. In this present application, the principle remains unaltered, although Maxwell's reversing commutator is replaced by a polarised relay, and the instrument used with a known capacitor to measure an unknown frequency.

Although laboratory tests of transformer iron are sufficient for many purposes, they are unable to maintain a precise quality control of the sheets themselves. The techniques described above, however, are eminently suitable for application to testing transformer iron, and, since they are non-destructive, are capable of use on whole sheets of steel on the production line.

Mechanically, the equipment comprises a conveyor belt, on which the sheets travel, passing through a flat, open-ended coil of six sections in parallel, giving a uniform flux density in the two centre sections. Secondary coils are wound beneath the primary windings on these sections to supply wattmeter and voltage control circuits. Loss is measured by supplying one element of a dynamometer wattmeter from the current in these two centre primary coils, the other element being fed, through an amplifier, from one of the two secondary coils. The other secondary winding, in conjunction with the same primary current (supplied from a second c.t.) effects control, through a suitable circuit, of the excitation of the alternator supplying the magnetising current.

DISCUSSION

PROFESSOR J. GREIG (King's College, London) said that his first contact with negative feedback amplifiers was also in connection with a magnetic measurement problem but it was not concerned with wattmeter measurements. It was concerned with flux measurements where the problem was to obtain the accurate rectifier mean value of the induced voltage where it was so small as not to be susceptible to conventional methods of rectification. A negative feedback amplifier was built which had good enough phase and amplitude response to give correct reproduction of the waveform for purposes of rectification. It was, therefore, particularly interesting to appreciate that

magnetic measurements could be made with such high accuracy utilising negative feedback amplifier technique in association with a wattmeter. He could confirm the efficacy of the polarised relay technique in relation to iron testing. The technique had been used with complete satisfaction and success.

DR A. H. M. ARNOLD (National Physical Laboratory) said that the feedback amplifier was such a valuable piece of apparatus that even the most hardened measurement engineer had to accept it into his stock in trade nowadays. There was, however, one danger which arose from its very virtues, namely, the feedback amplifier was designed, tested and found to be perfect and then that perfection was ascribed to the whole of the equipment.

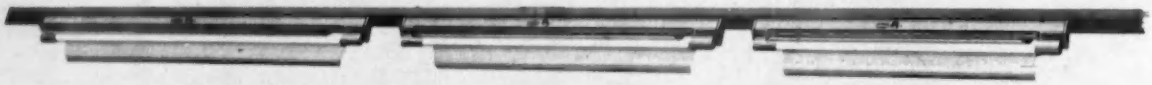
The author used a current transformer on the current side and the design of a current transformer to cover a wide range of frequencies was not a simple matter if an accuracy of 0·1% were required. That difficulty could, however, be overcome by putting the amplifier on both sides. Again, the dynamometer itself could be very good but it was not necessarily good, and the amplifier did not make the dynamometer any more accurate. Then there was the question of the voltage divider. That could be either a capacitance divider or a resistance divider. If it were the former quite good accuracy could be obtained and at a frequency of 50 c/s it was a nice piece of apparatus. At 5,000 c/s, however, it took quite a large amount of current and the system would be found to be not so good. If, on the other hand, a resistance divider were used, the design was much more difficult in order to keep within such accurate limits.

PROFESSOR F. BRAILSFORD (University College, London) pointed out that in the sheet tester described there was no return path for flux except that provided by the air leakage path, although the author mitigated that effect to some extent by overlapping the preceding and following sheets of the tester. In view of that, it seemed that the curve of flux distribution along the length of the sheet was quite surprising. The author stated modestly that it was moderately good when the variation was only 2%; but in actual fact to obtain uniformity of flux density along a sheet which was 3 ft wide and 8 ft long with a variation of only ± 1% seemed to be an extraordinary achievement.

In a written contribution to the discussion, MR F. S. EDWARDS (Metropolitan-Vickers Electrical Co., Ltd.) wrote that the suggestion in Mr Edmundson's paper that capacitance was an unwanted quantity was one with which he did not agree. For instance, in testing a thick slab of a new material some time ago he found that the power factor was quite low, about 0·2, but the permittivity was extremely high, about 20; in fact it could be said confidently that something was wrong. The measurements and calculations were checked and confirmed, and finally it was discovered that the material had alternate laminations of a good insulator and of an insulator so poor that it was virtually a conductor. The effective area under test was therefore considerably greater than the area of the electrodes. Those interesting but inconvenient characteristics of the material would never have been discovered simply from the power factor.

MR C. RYDER (Metropolitan-Vickers Electrical Co., Ltd.) said that on first glancing through the first two pages of Mr Edmundson's paper he felt convinced that he had come across the tester's dream. On reading a little more closely, however, his enthusiasm was dampened a little by the realisation that the virtue of the system really lay in the amplifier.

The crux of the matter seemed to be not so much whether an amplifier could be designed to do the job, but rather whether, when the amplifier was coupled with such a universal type of instrument as a wattmeter and put in the hands of a test department for use by people who were not electronic enthusiasts, it could be looked upon with the same degree of reliability as one would look upon an ordinary instrument.

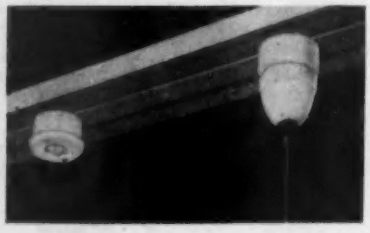


SHALLOW TRUNKING CUTS INSTALLATION COSTS

A NEW trunking system now available from the Edison Swan Electric Co. is designed to provide a simple yet elegant means of providing installation facilities for lighting and light power equipment. The trunking consists of a slotted duct, into which a snap-in cover strip can be pressed. It is supplied in 13 ft lengths which can be coupled together to form a continuous run, along which any standard type of lighting fittings (tungsten, fluorescent or mercury discharge) can be positioned as required. The channel is 4½ in. wide by 1¼ in. deep and can be supplied in Bonderised and enamelled steel or in extruded aluminium. The carrier plates for fittings can be slid along the channel and positioned where required, the spaces between fittings being filled in with appropriate lengths of cover strip. The carrier plate provides female entry for ¾ in. conduit outlets, or extensions or for standard suspension hooks. A reamed nipple with three lock nuts converts the entry to male for mounting fittings to the surface of the trunking. Since these fittings are standard conduit parts, standard fittings of any type can normally be used.

The whole of the interior of the trunking is available for wiring and as the insertion of the snap-in cover strip divides the interior into three compartments, it is convenient to allow the two outer ducts to take the principal circuits and the middle to carry to interconnections between fittings. The dimensions of the trunking are such that conduit outlets can be made in any direction. End-caps which terminate runs of trunking have three knock-outs to clear ¾ in. or 1 in. conduit by reaming the apertures.

The trunking is suitable for all normal methods of suspension by chain or conduit, considerably fewer structural suspension points being required than for an equal number of fittings suspended individually. Because of its shallow form it is particularly suitable for recessing in plaster or in acoustic tile ceilings. In buildings under construction the trunking can be mounted before concrete is poured to create concealed—but still accessible—cable runs with a flush surface.



The two large cable ducts are separated when cover strips are in position. With a cover strip removed there is ample space for handling cable, and (right) fittings can be easily attached to the duct

A 1 kW Mercury Arc Lamp for Mains Voltage

By E. J. G. Beeson and R. F. Weston*

THE introduction of a 1 kW (Type MA) lamp follows the increasing demand for another lamp of the MA type, (already well known in the 250 W and 400 W ratings) for operation from 200/250 V, 50 c/s. a.c. supply. High lumen output, good maintenance and reliable performance are some of the more important features of this type of lamp. The new lamp, however, fills a gap between the 400 W and the 2·5 kW lamp thus making more complete a range of horizontal burning glass type high pressure mercury vapour lamps.

The design objective has been to develop a simple type of lamp for horizontal burning without the use of magnetic arc control with maximum luminous efficiency. The arc

Fig. 1. General appearance of 1 kW mercury arc lamp

tube of the lamp is of BTH No. 37 alumino-silicate glass(1) which provides good mechanical strength, high resistance to thermal overload and shock, and inhibits the transmission of any harmful ultra-violet radiation.

Temperature Considerations

This glass which is one of the hardest known operates at a dull red heat and experience has shown that there is little or no deterioration of this glass when operating under adverse conditions, such as in smoke and dirt. It will be found that the temperature of the arc tube is sufficiently hot to volatilise most airborne materials or for them to be carried away by the air flow over the surface of the arc tube. Precautions must however be taken to prevent spots of water from coming into direct contact with the lamp as this may result in the arc tube fracturing but not necessarily completely shattering. It will be seen from Fig. 1 that the lamp terminates in special caps having design features which make them an integral part of the arc tube by being mechanically interlocked together—thus there is little possibility of the caps becoming detached from the arc tube. The current connections to the lamp are by two cylindrical cups on the caps about 7/8 in. in diameter and 5/8 in. in length having a large surface area to enable a low resistance contact to be made. One of the caps has an end contact to the starting probe in the lamp and on this same cap is a small ring to prevent the lamp from being inserted incorrectly into its holders. A current limiting resistor is fitted in the probe circuit and is enclosed within the lamp cap. The two main electrodes of the lamp are similar in design to those used in the present range of MA type lamps. Two helixes of tungsten wire are used to contain the emitter material and protect it from bombardment by the arc discharge. This particular form of electrode construction ensures good lumen maintenance throughout the life of the lamp.

Table I. Comparison of Characteristics of 400, 1,000 and 2,500 Watt Lamps

	400W MA	1000W MA/H	2500W MA/H
Supply volts	200/250	200/250	200/250
Arc voltage drop	110/165	110/165	140/150
Arc current (amps nominal)...	3·7	7·5	18·5
Starting current (amps) ...	5–6	10–12	25–30
Nominal apparent power factor...	0·92	0·9	0·94
Initial lumens per watt ...	38(1) 42(2)	47	52
Average through life lumens per watt	32 34	40	44
Life hours	4,000	3,000	3,000
Overall length (mm)	290 ± 8	476 ± 3	540 (approx.)
Maximum outside diameter (mm)	51*	40	70
Arc length (mm)	160	292	390
Caps	E40/45	S.22/19 and S.22S/21 with locating ring	Large Bipost
Lamp choke reference ...	MRG.501 and 2	Two MRG.524	MR.351B

*Protective outer envelope.
(1) MA/U
(2) MA/V horizontal operation with magnetic arc control.

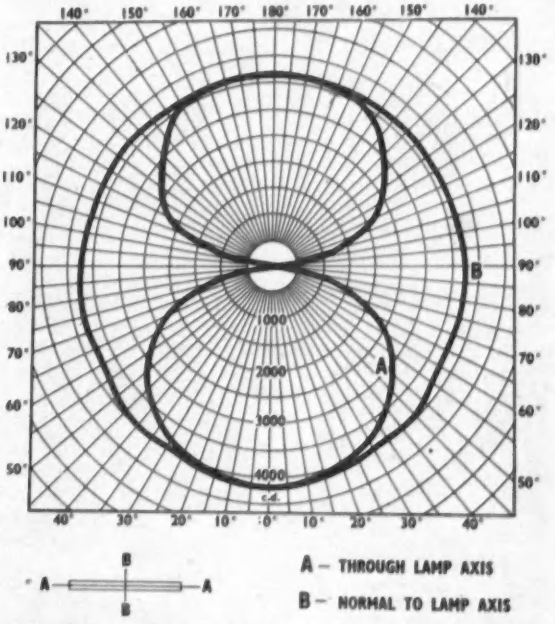


Fig. 2. Light distribution curves for 1 kW lamp, taken in two planes

Operational Characteristics

The electrical characteristics of the lamp are very similar to other lamps of this type requiring a simple series ballast such as a choke for a.c. mains operation. The lamp has a nominal arc voltage of 148 with an arc current of 7·5 A. It is self-starting on the normal supply mains and full

* Mr Beeson and Mr Weston are with the B.T.H. Co. at the Research Laboratory, Rugby, and the Lamp Engineering Dept., respectively.

brightness is attained some 4 minutes after switching on. When operating at its full mercury pressure it will be observed that the arc is only just noticeably displaced from the true axis of the arc tube and any downward displacement of the arc by a magnetic field would result only in a gain in light efficiency of less than 5%. Some of the more important data and dimensions are given in Table 1 which gives in addition figures for the 400 W and 2·5 kW lamp for comparison purposes.

The light distribution given by the lamp is shown in Fig. 2. As the source is linear, about 11½ in. in length, a simple reflector system can be designed to utilise the light source very efficiently.

This mains voltage 1 kW lamp for horizontal operation should help to reduce the maintenance problems in the semi-high bay lighting field where mounting heights of 25 ft to 45 ft are under consideration. For mounting heights above this the 2·5 kW lamp should be considered[2]. In factories where heavy plant and possible dirty processes are being carried out the lamp should result in improved standards of lighting. The operation of the lamp under adverse conditions may be considered with confidence.

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(1) The Industrial Chemist. December, 1951. (B.T.H. Research Laboratory Publication RLP 329.)
(2) B.T.H. Research Laboratory Publication RLP 223.

Electronic Computor for the Railways

SPEEDING UP A LARGE STORES ACCOUNTING SYSTEM

AT Crewe, one of the major accounting centres of British Railways, London Midland Region, the control of stores and other work has for many years been carried out by punched card equipment. This has now been accelerated by the introduction of an electronic machine—the E.M.P.—manufactured by Powers Samas. The letters E.M.P. stand for "electronic multiplying punch" and the machine, fast in operation yet simple to control, can calculate any multiplication problem up to a maximum of £999. 19s. 11·999d. × 99,999·99. The calculations are successively computed by two different electronic circuits.

Stores stocks of the order of £4,500,000 are held at Crewe, and the annual turnover is over £25,000,000. To provide control, statistical information and allocation for expenditure purposes, upwards of 10 million transactions are involved. One of the major problems is the documentation and control of an average daily movement of about 7,000 receipts and issues ranging over 60,000 different items. The amended modern system takes the documents for the previous day, and for each of these a 65 column card is punched and verified. These are then sorted at 600 cards/minute into catalogue number order, and then tabulated on a Power Samas tabulator to provide control figures and a list of items moved, which is used to hand pull the appropriate ledger sheets.

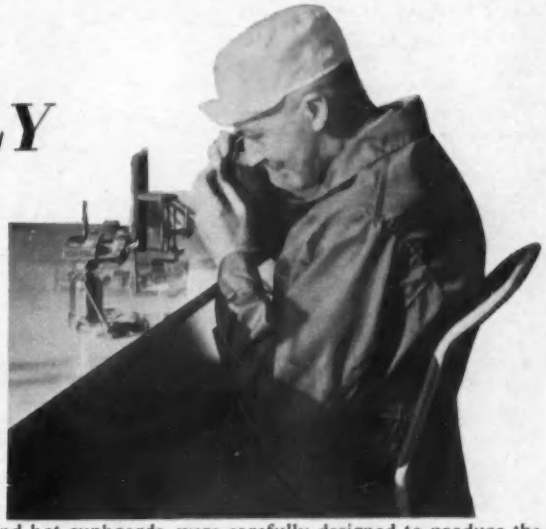
A balance card file also exists which has for every item in stores a punched card showing catalogue number, rate, class, unit and balance in value and quantity. These punched cards and the movement cards are then interpolated on an interpolator which rejects all balance cards which have no movement card, and all movement cards which have no corresponding balance cards.

The remaining pairs are fed into E.M.P. which at a constant speed of two calculations per second, senses the rate from the balance card, multiplies it by the quantity in the movement card or cards, checks its own calculation and punches the product into the movement cards. The total work is carried out in little more than an hour for the 7,000 computations.

Fig. 1. (Above) Interpolating ledger cards with detail cards

Fig. 2. (Right) The Electronic Multiplying Punch "E.M.P." with its operator

DUST-FREE VALVE ASSEMBLY



Special Rooms for Quality Production Processes

THE phenomenon of "lint" noise in special high quality radio valves has long been a source of trouble to both valve designers and users. This is particularly so in the case of the assembly of certain valves which contain grids wound with about 500 turns per inch and with electrode clearances of about one thousandth of an inch. In normal production processes, particles of dust, cloth fibres and other airborne impurities generically known as "lint" enter the electrode system and cannot be removed. Their presence usually results in noise, and in some cases premature failure of the valve.

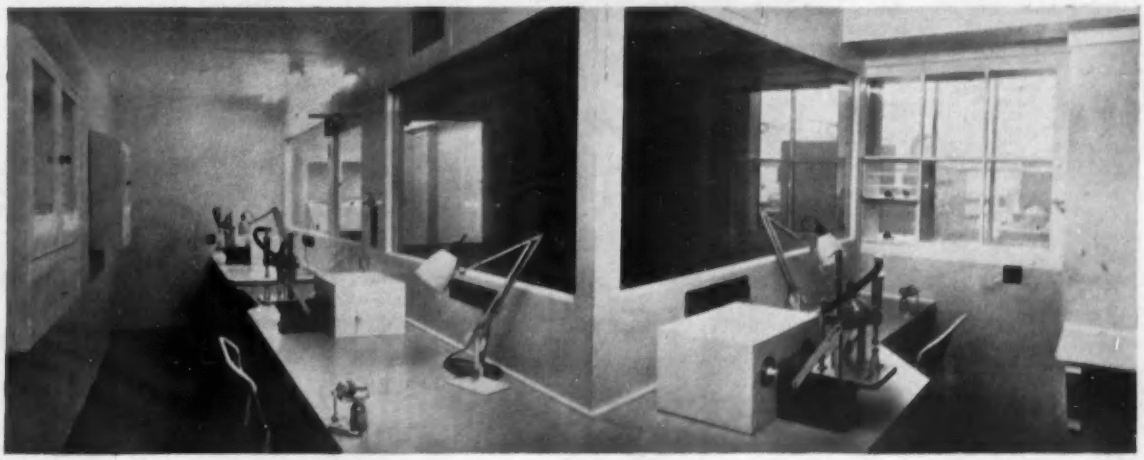
An obvious solution is, of course, to assemble the valve in a dust-free atmosphere, and this technique is now in use at the Research Laboratories of the General Electric Co. The space used measures 11 ft by 20 ft by 8 ft high and is divided by hardboard partitions containing large sheets of plate glass. The resulting structure, as can be seen from the general picture, consists of an "L" shaped room, a rectangular room and a small air lock which serves as a robing room. As the rooms receive little natural light particular care was taken in the colour scheme and in the lighting to make them pleasant to work in, within the limits imposed by dust-free conditions. Semi-matt finishes were applied to the eggshell blue walls and white ceiling to avoid excessive disturbing reflections from the overhead fluorescent lighting while wooden doors and partitions are covered with high-gloss cream paint. Tubular steel chairs are provided with plastic seats and backs and the floor covering of highly polished dark red linoleum adds warmth and colour to the pastel shades of the rooms. Benches, faced with green scratch-resisting Warerite, tool cupboards and hot cupboards, were carefully designed to produce the minimum of dust during use. Where possible, apparatus is enclosed in smooth metal boxes and exposed metal parts, such as vices and welding sets are electroplated or painted for ease of cleaning.

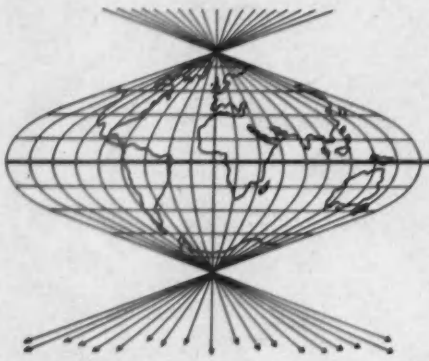
Filtration Plant

Housed in a gallery above the assembly rooms is the ventilating system which draws in air from outside, filters out particles of dust more than 5 microns in diameter (one micron=0·001 mm.) and delivers 1,000 cu ft per minute of clean air to the workrooms below. This results in a complete change of air in the "L" shaped room every 2½ minutes. Temperature of the incoming air is regulated by a thermostatically controlled 10 kW electric air heater mounted in the duct. Air leaves the room by non-return louvres built into each of the doors, and escapes into the main laboratory through the air lock.

Traffic into the room is kept to a minimum, and operators wear nylon overalls, buttoning at neck, wrists and ankles, and fitted with a zip-fastener at the front. A nylon cap to cover the hair and leather slippers in place of shoes are provided. Future requirements may impose even more stringent conditions of cleanliness, and provision has been made to filter down to particles of 0·2 micron diameter.

General view of the dust-free valve assembly rooms at the Research Laboratories





OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Appliance Outlook

A 4% reduction in production in 1954 for Canada's electrical manufacturing industry—the first for over 15 years—is reported. In announcing this, Mr A. W. Howard, president of the Canadian Electrical Association, said the decline was attributed to a general decrease in industrial activity and the effect of competition abroad, especially in the electrical apparatus field. He said that 78% of Canadian homes have refrigerators, 50% vacuum cleaners, 96% radios, 83% washers and 22% TV. Of the 3,600,000 Canadian households 92% now received an electricity supply. A few days earlier, Mr J. H. Smith, vice-president of the Canadian General Electric, told appliance dealers in Montreal, that a study of economies left no doubt that 1955 should be a good appliance sales year. Basing his prediction on expected stable employment, good rate of housing construction and high savings, he emphasised that dealers would be facing a buyers' market.

Vision in B.C.

The possibility of using the Homathko river system for power generation has been under study by the British Columbia Power Commission. This has been stated by Commissioner H. H. Griffin, who said that with the growing loads the prospects of harnessing the waters "were far less visionary". He was commenting on a statement by Mr C. Harrison mayor of Victoria, that the Chilko lake-Homathko river system was one of the greatest power sources in the province with a potential output of 1,500,000 h.p. He said a dam there would relieve the necessity of damming Buttle Lake on Vancouver Island.

Power from Shale

The proposals of the Nashwaak Corporation, of Montreal, for the establishment of a shale-burning project, involving the erection of a large power station in New Brunswick, are considered "technically feasible and practicable" by the U.S. technical research concern which has reported to the Provincial Premier, Mr Fleming, on the matter. But it is stressed that failure to cope successfully and economically with several problems (such as the disposal of some 1½ million tons of ash per year, and the possibility of sea water inflows to the mine's open pit) could well lead to "financial embarrassment to the mining company, and jeopardise the power contract." The proposals suggest a 59,000 h.p. steam power station, which could produce power at the plant site, before transmission, for 10·1 mills per kWh, it is estimated. Nashwaak Corporation have stated that those figures are on the basis of a 25 year contract with the New Brunswick Electric Power Corporation which would take around 300 million units annually—the full output of the plant. Ore reserves of oil shale of 100 million tons would be ample to fuel a 59,000 h.p. plant for 53 years, without discovery of additional reserves. The new process of combustion and the operation and control of the reactor will probably bring some new problems, which are expected to be solved satisfactorily, but it is suggested that the inclusion of fuel oil firing equipment would ensure normal availability of the generating plant during the adjustment period.

U.S.A.

Lowest Tender

The English Electric Export and Trading Co. has submitted the lowest bid for the supply of six generators for the Chief Joseph Dam project, it is revealed. The British firm's tender price is $5,460,361—some 13·8% below the lowest American bid, that of Westinghouse, of $6,338,491. It would therefore seem that their tender has more than met the requirements of the revised Buy American Act. The bids now await the evaluation by the Defence Department. The result is awaited with considerable interest.

HONDURAS

Development Plan

A plan of economic development in Honduras, drawn up with the assistance of the International Bank for Reconstruction, envisages the expenditure of approximately £54m over the next five years on a variety of construction and improvement projects. In preparing the plan a study has been made of the country's hydro-electric power resources. From these it is concluded that the most convenient site for a plant, with an initial capital of 15 MW, extending perhaps ultimately to 100 MW, would be the River Lindo, north of Lake Yojoa. The committee recommends the setting up as soon as possible of a National Electricity Co. to organise and operate such a plant and all other public service plants in the country. It is suggested that such an organisation should also be responsible for generation, transmission and distribution throughout the country, entailing the erection of h.v. power lines and extensions to the distribution network. Estimated cost of this work is put at nearly £4m.

EUROPE

Work in Poland

The new electric power station at Przewoz, near Cracow, Poland, on the Vistula is now undergoing trials. It is the first of a group of hydro-electric stations which will be built on the Vistula, we understand.

Alps Discussions

The Austro-Swiss Commission for the exploitation of the Inn between Martina (Switzerland) and Prutz (Austria) for hydro-electric power has agreed that the plan proposed by the Oberer Inn G.m.b.H. Innsbruck would provide a suitable basis for discussion with Swiss enterprises interested in the project.

Underground for Rome

Rome's first underground railway, approximately seven miles in length, was formally opened earlier this week, following the usual preliminary testing runs by two carriage trains. Construction of the system was originally ordered back in 1938, but was subsequently held up by the war.

More Plant

The Spanish Ministry of Commerce has granted Hidroelectrica Española permission to import the third and largest of three generator groups for its new $21 million thermal power station in Escombreras bay, near Cartagena. The third group will have a capacity of 140,000 kW—double that of each of the first two groups. The whole of the plant has been purchased from General Electric, of America. Installation of the first group of 70,000 kW will start in October this year; it is to begin operating a year later. The second group will be installed immediately afterwards and will

start operation six months after the first; while the third group should be ready to start functioning by the middle of 1957. Estimated production of the new power station will be 1,400 million kWh annually. Hidroelectrica Española's total production output will then be over 2,700 million kWh annually. The total cost of the U.S. equipment—$21 millions—is being spread over nine years.

EGYPT

Plans for Cairo

We have news from Cairo, that the Misr Bank is proposing to assist in the establishment of a company, with a capital of £E.44,000, for the production of electricity meters. At the present time Egypt imports about 75,000 meters annually. Apart from Ah. meters and voltmeters, it is suggested that the factory may also manufacture transformers.

It is also reported that trolley buses are to replace tramways in certain parts of Cairo in the near future. An agreement to this effect has been reached between the Cairo Municipality and the Cairo Tramway Co.

AFRICA

Double Check

The Rhodesia and Nyasaland Federal Government has now engaged a firm of accountants from the U.K. to report on the estimates of construction costs of the proposed Karifa and Kafue hydro-electric schemes, Sir Malcolm Barrow, the Minister of Commerce and Industry. Obviously the Federal Government are determined to be fully advised on all aspects of the two hydro-power schemes before making their decision.

AUSTRALIA

First 220 kV Line

A new 220 kV power line running 153 miles from Kiewa over mountainous country to Melbourne, Victoria, was officially inaugurated last month by the State Electricity Commission. The line has been completed in readiness for the operation this month of the new Kiewa No. 4 power station (as we noted last week). The transmission line consists of 650 steel towers, passing over 4,000 ft mountain ranges. At the inauguration, Mr Galbally, Minister for Electrical Undertakings, said the new Kiewa-Melbourne line was the first section of a 220 kV super-grid. The first circuit of the 220 kV Yallourn-Melbourne section was complete, but was temporarily operating at 132 kV. It would later be connected with the new Kiewa line at a switching station to be built at Rowville, north of Dandenong. The new line crosses Eildon Reservoir from Mt. Enterprise to Mt. Pinninger in a single span over one mile and one-third long, one of the longest cable spans in the world. The towers are designed to carry two circuits but initially one has been erected.

Acquisition

An Order-in-Council has been issued in Queensland extending the Southern Electric Authority's supply area to include the area served by Toowoomba Electric Light and Power Co., Ltd. The Mines Minister, Mr McCathie, has said the transfer was another step in the Government's plans for Queensland electrical development on regional lines. For the whole south-eastern part of the State there are now only two electric authorities—the Brisbane City Council and the Southern Electric Authority, Mr McCathie explained.

NEW ZEALAND

Fuel Co-ordination?

The linking of the vast hydro-electric resources of New Zealand's South Island with those of the North Island, and the co-ordination of all sources of power and light under some form of commission control, has been advocated by Mr C. T. Lovegrove, of the Auckland Electric Power Board. Every supply authority must be ceaseless in its advocacy of the integration of power between the North and South Islands, said Mr Lovegrove. Every engineering concept gave warning to prepare for that transmission across Cook Strait. Every economic principle demanded it. He had been amazed at protests against the transmission of power to the North Island. It made him wonder if the South Island was part of the Dominion. The gas industry was another problem to be faced. He had long advocated some form of co-ordination between the gas and electricity supply industries, and he did not believe they would get worthwhile co-ordination while one was controlled by the people and the other by private enterprise, he added.

Another Waipori Plant

No. 4 station, the last in the chain in the Dunedin city council's Waipori hydro-electric scheme, is expected to be in operation this month, Mr G. T. Edgar, the city electrical engineer, has announced. The station has a capacity of 7,200 kW, and is remote controlled. It is situated more than a mile further down the Waipori River from the No. 3 station which began full operation last Aug. There are thus, now, four power stations utilising the same river water.

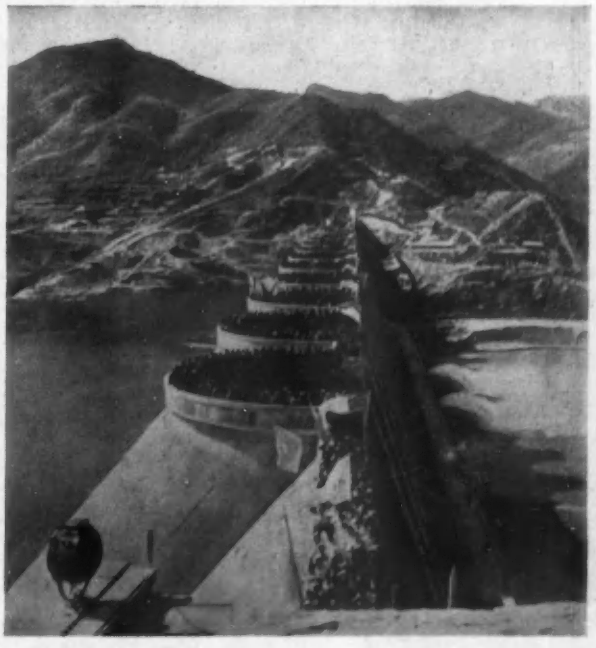
New Consumers

The Supply Department of the Auckland Electric Power Board, New Zealand, is keeping up, and in fact, increasing, its pace in connecting new consumers to the mains. In recent years the total of new consumers has been around 3,000 annually. For the last six months of 1954 however, the Board connected power to homes at the rate of about 350 a month. In Dec. alone it made connections to 517 homes. There is an indication here, too, of the expanding market for domestic appliances.

JAPAN

Funds Needed

Japan's state organisation, the Electric Power Development Co., is seeking new funds totalling some 32 million yen, for expenditure on various developments projects during 1955. The company intends to proceed with a number of hydro-electric schemes on the Kumano River, which would have an installed capacity of 200 MW, during the next five years.



An impressive feature of a combined irrigation and hydro-electric project, the Futseling reservoir on the Piho River, in Anhwei Province, China, is the fifth, and so far the largest, completed reservoir in the major project to control the Huai River. Our photograph alongside, was taken at the recent official inauguration of the multiple arch dam. A power station is now nearing completion nearby, which will have an estimated annual output of 57 million units. The reservoir itself, has a capacity of 500 million cu metres, and will be able to irrigate 46,000 hectares of farmland along the Piho River

Personalities

IN THE INDUSTRY

Mr L. F. Southorn has been appointed manager of the Sheffield office of C. A. Parsons and Co., Ltd., in succession to **Mr A. N. G. Wood** who has retired.

Mr C. J. Williams has been appointed to succeed **Mr J. A. Wellings** as manager of the Casting Division of High Duty Alloys Ltd. Mr Wellings relinquishes the appointment to take up his new duties as director and vice-president of Canadian Steel Improvement Ltd., in Toronto.

The President of the Republic of Brazil has conferred the Order of the Southern Cross of Brazil—rank of Commander—upon **Mr R. S. Hex,** F.I.C.S., a regional manager (overseas) of British Insulated Callender's Cables Ltd. and a member of the Council of the Brazilian Chamber of Commerce and Economic Affairs in Gt Britain, of which he was chairman from 1951 to 1953. Mr Hex has been a member of the Council since 1945 and is at present chairman of the committee dealing with exports to Brazil. Before joining B.I.C.C. he was general manager of Wilson, Sons and Co. Ltd., London.

Mr E. A. Langsdon has rejoined Ionlite Ltd., as manager of the company.

Mr E. G. Rowledge, a director of the Pressed Steel Co., Ltd., is now on a business tour of Australia and New Zealand. He will return to this country via South Africa.

Deputy station superintendent at Skelton Grange power station, Yorkshire Division, B.E.A., for the last two years, **Mr G. T. Shepherd,** B.SC.(ENG.), A.M.I.MECH.E., A.M.I.E.E., has now joined the Authority's Nuclear Power Department. He started on the Reactor Design Engineer's Course at Harwell last month. Educated at King Edward VI School, Birmingham, Mr Shepherd served an apprenticeship with G.E.C. and was afterwards employed at Hams Hall "B" and Portishead power stations before going to Kirkstall as shift charge engineer. He then went to Skelton Grange power station in a similar capacity prior to returning to Kirkstall as boiler house superintendent.

Lt.-Col. P. W. Dollar and **Lt.-Col. L. A. M. Bates-Oldham** have been appointed directors of Aberdare Cables (Holdings) Ltd.

Mr Y. A. Fozalbhoy, managing director of General Radio and Appliances Ltd., of Bombay, has been appointed a member of the Development Council for the Light Electrical Industries under Section 6 of the Industries (Development and Regulation) Act 1951 set up by the Government of India.

Sir Claude Gibb, chairman of C. A. Parsons and Co. Ltd., is due to leave England on 16 Feb. for a week's visit to Canada.

Mr H. H. Smith, assistant manager of the Special Vessels Department of Babcock and Wilcox Ltd., has been appointed sales manager of Edwin Danks and Co., Ltd.

Three new appointments by the British Thomson-Houston Co. Ltd. are announced. **Mr H. B. Mellor,** ASSOC.I.E.E., M.A.M.E.M.E., has recently transferred from the Lighting Department of the B.T.H. Birmingham office to the power and apparatus side of the company's business and will operate chiefly in the Potteries area. He joined the company in 1947 as lighting engineer in the Leeds district, having previously been chief engineer with the Bective Electrical Co., Ltd., London, and senior installation engineer with the Yorkshire Electric Power Co. **Mr R. G. Mills,** who until recently was with A.E.I. (India) Ltd., has now been appointed to B.T.H. Sheffield office as a power engineer. He first joined B.T.H. as an engineering apprentice in 1942 and afterwards spent some time at the company's Birmingham office and in the Switchgear Sales Department, Willesden, before going to India in 1952. The third appointment concerns **Mr J. Nicholson,** B.SC., A.M.I.E.E., who has joined the B.T.H. Manchester office as a power sales engineer. After completing his initial apprenticeship with the B.T.H. company, Mr Nicholson entered Leeds University in 1934, and returned to B.T.H. for further training in 1937. After war service he returned to the company in 1946 and was appointed to B.T.H. Sheffield office. In 1951 he joined David Brown Foundries Co., Penistone, as works engineer, but rejoined B.T.H. at the beginning of 1955.

Mr J. V. Thomas, sales director of Auto Diesels Ltd., is now in Africa on a comprehensive business tour. His itinerary includes Cairo, Johannesburg, Laurenco Marques, Salisbury, Bulawayo and Leopoldville. He is expected to return to London early in April.

The Council of The I.E.E. have elected to Honorary Membership of The Institution **H.R.H. the Duke of Edinburgh,** K.G., P.C., K.T., G.B.E., F.R.S. His Royal Highness has signified his acceptance of this election, and the Council make the announcement with particular pleasure in view of the interest which His Royal Highness has long shown in science and engineering and their applications.

The Governing Body of Queen Mary College has elected to Fellowship of the College **Prof H. R. Robinson,** Vice-Chancellor of London University and former Head of the Physics Department of the College.

The North of Scotland Hydro-Electric Board has appointed **Mr Douglas C. Neillands,** M.A., LL.B., as assistant secretary to the Board. Educated at Daniel Stewart's College, Edinburgh, and Edinburgh University, Mr Neillands was admitted to the Faculty of Advocates in 1946. He served in the R.A.F. during the

Mr R. S. Hex

Mr G. T. Shepherd

Mr H. B. Mellor

Mr R. G. Mills

Mr J. Nicholson

war, and was a magistrate in Nigeria from 1944 to 1946. He was assistant legal adviser to Courtaulds Ltd. before joining the staff of the Hydro-Electric Board in 1948.

Technical manager for the Hoover Ltd. Northern branch and for Southern Ireland, **Mr D. V. Burling** has been awarded a gold watch in recognition of his completion of 25 years' service with the firm.

Sir John Black, who only two months ago became deputy chairman of Enfield Cables Ltd., resigned that appointment last week. In announcing this, the board stated that Sir John was unable to devote the necessary time to the executive duties involved.

Mr Shilling, right, receives the presentation

Mr A. E. Shilling has been appointed director and secretary of the Covered Conductors Association. Mr Shilling, who has been its secretary since 1937, joined the Association in 1930 and in recognition of his 25 years' service he was presented with a wrist watch by **Mr G. E. Jewell,** chairman of the C.C.A., at the Association's Annual Dinner at the May Fair Hotel recently. At the same function a similar presentation was made to **Mrs M. Dinan** on completion of 25 years on the staff of the C.C.A. A wrist watch was also presented to **Mr F. Harries** (B.I.C.C.) in appreciation of special services rendered to the Association. Our accompanying photograph above shows the presentation to Mr Shilling by Mr Jewell.

Mr J. V. Farnham, managing director of Fuel Firing Ltd., has left for South Africa for an extended visit in connection with a number of power station projects to the Union.

Mr A. J. R. Veale, ASSOC.M.C.T., is now superintendent, Process and Rate Department of the Metropolitan-Vickers Electrical Co., Ltd., succeeding **Mr W. A. Bull,** B.SC., A.M.I.MECH.E., ASSOC.M.C.T., who is continuing to assist the works management on special problems. Assistant superintendent of the Process and Rate Department is now **Mr M. O. Short,** B.SC., A.M.I.MECH.E., ASSOC.M.C.T.

Mr D. E. H. Pierson has been appointed secretary of the U.K. Atomic Energy Authority. In April next, **Col. G. W. Raby** is to take up the post of deputy director of engineering to the research group at Harwell. Col. Raby, was apprenticed with B.T.H. in 1916, staying with them until 1928, by which time he had risen to the position of superintendent-controller, factory. For the next six years he was manager of the turbine works of Richardson's Westgarth and Co, and in 1934 went to the English Electric Co, at Rugby where he became an assistant general manager concerned with new development and research. Later, after assisting Professor Cockcroft (now Sir John Cockcroft) in the development of radar, he was appointed chief superintendent of the Signals and Development Establishments at Christchurch and Woolwich. He has since been in Africa.

Chairman of the Brush Group Ltd., and of other companies, **Sir Ronald Matthews** has been appointed deputy chairman of the Independent Television Authority, in place of Sir Charles Colston, who resigned in December.

At a recent annual general meeting, **Mr E. J. Davies** and **Mr P. E. Wheatland** were re-elected chairman and vice-chairman respectively of the Association of Manufacturers of Electric Wiring Accessories.

Mr R. Nicholls and **Mr B. W. Pickup** have been re-elected chairman and vice-chairman respectively of the Association of Manufacturers of Small Switch and Fuse Gear.

Mr J. C. Drewe has been appointed managing director of Peto Scott Electrical Instruments, Ltd. He is a director of Thorpe and Thorpe, Ltd.

Mr H. Finch, M.A.S.E.E., A.S.M.E., and **Mr P. Rose** have been appointed directors of Volex Electrical Products, Ltd.

Mr D. McClure, first assistant district engineer, western district of the Fife subarea, South-East Scotland Electricity Board, and **Mr J. MacDougall,** district commercial assistant, in charge of the Lochgelly and Dunfermline showrooms, were recently the recipients of presentations made by Mr C. H. A. Collyns, subarea manager, to mark their 35 years of service in the industry.

The Stanton Ironworks Co., Ltd., announce that **Mr G. R. Buckley,** general works manager, has now been appointed a director of the company.

Northern Aluminium Co., Ltd., announce the following new appointments: **Mr B. N. H. Thornely,** a director, has been made secretary of the company, in addition to his present duties; **Mr E. A. Trigg,** formerly with Aluminium Co. of Canada, Ltd., has been appointed chief financial officer; and **Mr J. Mason,** formerly assistant treasurer, is now chief accountant.

Chairman and managing director of Mansfield Factors (Electrical Supplies) Ltd., **Mr R. Lowe** has been elected to the board of directors of T. D. Young and Sons Ltd., of Nottingham, and will act as joint managing director with **Mr W. A. Beeston.** Mr Beeston's son, **Donald F. Beeston,** has also been elected to the board. The two companies will now work in close co-operation, and joint purchasing arrangements may be arranged in the near future.

To commemorate his fifty years in the electrical trade, **Mr Norman Aish,** A.M.I.E.E. of Aish and Co., Ltd., of Bournemouth, was recently the recipient of presentations made at a dinner at the Grand Hotel, attended by the staff of the firm and guests. Mr Aish, who founded the firm in 1913, was president of the Electrical Contractors Association in 1947-48.

Having reached retiring age, **Mr C. F. Wells,** M.I.E.E., A.M.I.I.A., chief commercial officer to the South Eastern Electricity Board, is leaving shortly. After general training with Edmundsons Electricity Corporation and subsequent experience in the generation and sales departments at Dundee, Swindon and Woking, he joined the Yorkshire Electric Power Co. in 1919, becoming sales manager of all the companies in that group. He joined Seeboard on nationalisation in 1948 as chief commercial officer. He serves on many national committees including the E.D.A. Council.

Dr H. Heywood, of the Imperial College of Science and Technology, London, has been appointed to a technical advisory committee for a world symposium on applied solar energy which is to be held in Phœnix, Arizona, in November.

OBITUARY

Mr Archibald Johnston, M.I.E.E., M.INST.T., who was engineer to the Swansea-Mumbles Railway, and the Swansea Improvements and Tramways Co., died on 2 Feb.

Mr K. H. Shipton

Mr K. H. Shipton, B.S.C.(ENG), A.M.I.E.E., who has been deputy chief engineer in the Switchgear Department of South Wales Switchgear Ltd. for the past five years, died on 30 Jan. Prior to going to South Wales, he was for seven years assistant engineer with Crompton Parkinson Ltd., and also spent two years with Foster Transformers Ltd.

Mr H. S. Carnegie, M.I.E.E., deputy chief engineer of the English Electric Co., Ltd., and head of the special engineering section at Stafford, has died, aged 63. Many years ago he was with Siemens Bros., in London, and he moved to Stafford in 1926.

NEW LITERATURE

Electrical Trades Directory, 1955

A FURTHER expansion has taken place in this edition, another indication, if that is necessary, of the continuous effort involved in making the directory as complete as possible. Its size has, in fact, doubled since the war, which may also be taken as a reflection of the expansion of the Electrical Industry itself. In this volume, the style and arrangement is much the same as that in previous years, but new headings have been included under the Products and Materials Sections together with additional names of manufacturers. Particular attention has been paid to the electronics industry in view of the rapid developments in that field in recent years. Once again, the directory provides a ready guide to the sources of supply of all type of electrical and allied equipment and the indexing arrangements make reference a simple matter. The classified list of plant, etc., occupies nearly 900 pages, in addition to which there are alphabetical sections devoted to manufacturers, merchants, contractors, engineers and associations, with a further extensive list of trade names, making it an invaluable book of reference. Published by Benn Bros., 1,600 pages, 9 in. by 6 in. Price 65s.

Questions and Answers on Distribution and Use of Electric Power

by T. H. Carr, M.I.C.E., M.I.MECH.E., M.I.E.E., M.I.F.

NEWNES Q. and A. Manuals, as these handy books are called, have established themselves by virtue of their usefulness to engineers, in putting forward practical solutions to the sort of problem that arises during the course of their duties. This latest publication is concerned mainly with the supply industry and is aimed at engineers in all branches whether on transmission, distribution or utilisation.

The book opens with a section on overhead lines, covering the range from rural to 132 kV with worked examples on line calculations, capacitance and other functions. There follows a chapter on cables, in which such questions as reason for breakdown, cable-box design and charging current are mentioned. Transmission and distribution systems are introduced and a section on substations follows, various types being illustrated and reasons for alternative arrangements being discussed. Secondary batteries, street lighting and heating appliances are then each devoted a section and power factor correction is mentioned particularly when induction motors are dealt with. Variation of voltage and its effect on heating apparatus and sections on metering and tariffs together with a few useful tables wind up this excellent book. Published by Geo. Newnes Ltd., 112 pages, 6½ in. by 4 in. Price 6s.

Electric Light and Power Installations

by E. T. Lawson-Helme

THIS book is intended to help, advise and instruct those younger members of the electrical industry engaged in wiring, installation, testing and repair of electrical equipment in buildings. No attempt has been made to enter deeply into the technology of all equipment concerned, but the basic principles have been dealt with in order to give the reader a firm grounding.

In the introductory chapters, the nature of electricity supply, basic considerations of electromagnetism and induction are discussed, and then the book moves on to the main subject matter.

The importance of complying with I.E.E. regulations when dealing with domestic installations, is stressed and their application to current practice with regard to ring circuits and the use of socket-outlets is mentioned. Wiring in conduit, with illustrations of typical layouts show the various fittings such as elbows and tee-pieces. Bells, bell-circuits and lamp signal devices are next dealt with and at this stage a reminder that the cheapest piece of equipment is not necessarily cheapest in the long run is included. Quite a large part of the book is concerned with industrial motors and control gear, circuits for various arrangements being shown and the basic theory of their operation discussed. Three-phase motors and star/delta starters are given separate treatment. The book concludes with a survey of the causes of breakdowns for various types of installation and some notes on private plant installations. Throughout, mathematics has been avoided and the text is liberally supported with illustrations. Published by Cassell and Co., Ltd., 176 pages, 7½ in. by 4¾ in. Price 4s. 6d.

Crystal Rectifiers and Transistors

Ed. by M. G. Say, PH.D., M.SC., M.I.E.E.

MUCH has been said of transistors and germanium crystal rectifiers over the last few years, and their increasing use has probably caused engineers to enquire as to the scope and limitations of their use. It is the aim of this book to put forward an up-to-date survey of the position with regard to their use, and to set out the problems associated with their manufacture and achievements so far. In order to ensure that the work is comprehensive, information has been drawn from American as well as British sources. After a preliminary survey of the characteristics of semi-conductors and a little history of their development, the book moves into its main theme.

Silicon crystal rectifiers prepared as "p" type semi-conductors have been used for many years in radar apparatus. The method of obtaining the boron-silicon crystals and coaxial construction of typical crystal valve precede a description given, together with dimensions and type numbers, of all the commercial types of valves. Germanium crystal rectifiers are then discussed in great detail, performance characteristics being illustrated for many types, and various circuit arrangements being shown, including a decade counting system which employs these components. Point-to-point contact and junction transistors are then described and the book winds up with chapters on testing and photo-transistors. The treatment is essentially practical, characteristic curves for various components performance are included and many circuits are given. To engineers with little knowledge of this comparatively new subject, this book should prove invaluable although the hitherto unpublished information should also prove of assistance to those familiar with these devices. Published by Geo. Newnes Ltd., 170 pages, 8½ in. by 5½ in. Price 21s.

The Amplification and Distribution of Sound

by A. E. Greenlees, A.M.I.E.E.

THIS new edition differs little from its predecessor published six years ago, the major changes being revision and enlargement of the text to include more recent developments. Items which have come into more general use with the advancement of the technique of this subject have also been incorporated. All in all, the book remains as a valuable guide to all technicians and engineers concerned with the problems of sound amplification, its most important feature being the emphasis on practical considerations, which runs as a common theme from start to finish. It covers the ground thoroughly, ranging from fundamentals to general installations and specifications. Between this alpha and omega it deals fully with audio frequency amplifiers, apparatus such as microphones, reproducers, and loud speakers, installation planning, and equipment operation maintenance and testing. Third edition, published by Chapman and Hall, 300 pages, 8½ in. by 5½ in. Price 35s.

BOOKS RECEIVED

Electricity in Your Home. Revised edition, brought up to date with respect to modern electric appliances and their use, for the lay reader. Second edition, published by Educational Publications Ltd., 17 Denbigh St, S.W.1, 32 pages, 4¾ in. by 7 in. Price 1s. 6d.

Ibbetson's Electric Wiring, Theory and Practice, edited and revised by C. R. Urwin, W. F. Parker and F. G. Thompson. New edition of standard work on electric installation practice for both students and practical wiremen. Ninth edition, published by Spon, 296 pages, 7½ in. by 4¾ in. Price 11s. 6d.

PROBLEMS AND PRACTICE

In Engineering

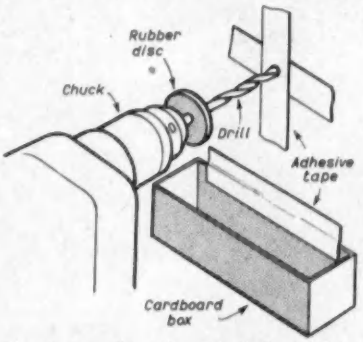
Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Masonry Drilling

IN many situations, the electrician must be careful to make as little mess as possible when doing installation work. Typical situations are food manufacturing plants, laboratories, hospitals and the like. One feature of masonry drilling, prior to placing fixing plugs in the walls, is the tendency for a very small amount of grit and dust to spread itself over a very wide area.

A very efficient dust catcher comprises a small cardboard box stuck to the wall below the hole being drilled. If adhesive tape is used for fixing the box to the wall, about 90% of the grit from the hole will be caught in it. The tape is arranged to bridge the junction between the wall surface and the top edge of the cardboard box.

With twist drills used in portable electric tools, I have found that the grit



This diagram shows the method of minimising dirt when drilling masonry and of preventing the plaster from crumbling away

feeds its way along the drill flutes and penetrates the interior mechanism of the chuck, from which it is very difficult to extract. The thing to do is to prevent the grit from entering the chuck and an effective barrier is a small diameter rubber disc pushed along the drill and making contact with the chuck front face. Any grit travelling along the drill flutes will be spun off the edge of the disc. This precaution is worth taking as it requires very little grit to jam completely the interior mechanism of a good drill chuck. Their servicing is quite a complicated job and deterioration is rapid if they are abused.

Another valuable duty performed by the rubber disc is in preventing damage to the wall surface. The drill often plunges rapidly into the masonry and is stopped by the front of the chuck butting against the wall; a circular indentation is formed which may be objectionable. The rubber disc acts as a soft buffer and prevents damage.

Some walls are covered with plaster of very poor quality which falls away in lumps as soon as drilling commences. To bind the surface together so that it is supported, crossed strips of adhesive tape can be applied over the hole position.—*C. T. Bower.*

Overheated Motor

OVERHEATING of motors is generally the result of pure overload or impeded ventilation. In a recent case of a 50 h.p. pipe ventilated motor, load readings were quite normal, the piping up of the motor appeared to be satisfactory and the windings were quite clean.

The motor was of the double pipe ventilated type, the inlet pipe being at the opposite to the driving end and the outlet pipe at the driving end. The motor was provided with a ventilating fan at the driving end, the endshield having two facings one blanked up, and the other carrying the outlet pipe. It was clear that the position of the outlet pipe had to be fixed relative to the direction of rotation and in this case the pipe was on the wrong side of the endshield.

Fortunately the driven machine was not uni-directional and to save disturbing the pipe system the motor was reversed with immediate drop in temperature rise. With motors of this type it is essential to ensure that the direction of rotation is considered and the motor piped up correspondingly.—*"Torque."*

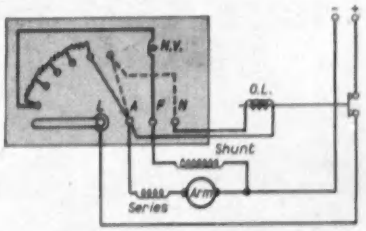
Motor O.L. Switch

A PROBLEM centred around the operation of light chain conveyors running in zig-zag fashion, through stoves, for drying purposes. The character of the load and the method of its attachment to the chain were the chief factors in rendering these conveyors liable to periodic jamming. This resulted in frequent chain breakages with consequent lengthy periods of production loss due to the difficulty of carrying out repairs in the hot atmosphere, and, also, to the accompanying necessity for completely removing the load from the conveyor before repairs could be commenced.

Some form of protective equipment was obviously required, but, in order to give adequate protection to the chain, it seemed that instantaneous release was the only form worth considering. The driving motors were ½ h.p., compound wound, d.c. machines, and hence capable of operating against a substantial overload torque. It was extremely doubtful, therefore, whether the use of a time-lagged overload release would guarantee tripping before chain breakage occurred. In any case, there would be a serious tendency for link weakening to take place in these circumstances.

In view of the starting currents involved, the problem, then, resolved into finding a reasonably simple method of effectively fitting instantaneous overload releases. The matter was solved in the manner illustrated in the accompanying sketch.

Starting was by means of small faceplate starters so that it was only necessary to remove the original armature connection (shown dotted) from the last stud of the starter and reconnect it to the next preceding stud (shown in full line). At the same time the resistance unit connected between the two studs was removed to allow it to be replaced by the actuating coil of the overload trip. An extra terminal (N), together with the chain dotted connection was provided for this purpose. It only then remained for the trip contact to be interposed in the main positive lead. As is obvious from the diagram, the overload release only became effective when the starter arm engaged on the last stud.



Arrangement of m.c.b. to protect a chain conveyor drive, with modified starter connections

It was deemed desirable to locate the miniature c.b. employed for the purpose in a remote position in order to alleviate the risk of chain breakage through unauthorised resetting and restarting on overload.

The desirable setting for overload tripping was only slightly in excess of normal full load current but it was found by experience that a small extra margin was required to cover variations in full load current due to extra cold oil conditions, and other factors. Even so, the method was extremely effective in cutting out lengthy stoppages, since when the c.b. tripped it was merely necessary to locate and remove the offending obstacle before restarting.—*F. Butcher.*

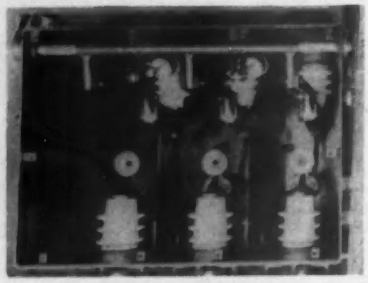
Equipment for Industry

Latest 33 kV Oil-Switch

LAST year A. REYROLLE AND CO., LTD., Hebburn, Co. Durham, introduced their latest range of 33 kV, 750 MVA switchgear type L42T. The main features of this gear were the compact design and the facility with which circuit-breakers could be raised or lowered within their cubicles. Recently the firm has announced the introduction of a new oil-switch which lines up with this switchgear. Type 33PI as it is called, is of the fault-making load-breaking variety and has been tested to make on to a fault of 750 MVA at 33 kV. Normal rating is 400 A. Unit construction has been employed which permits the switches to be used separately or in the form of composite switchboards and they may also be assembled in conjunction with the o.c.b. units without the use of trunking. Frame standards have the same centres and are identical with those used for the L-42T switchgear and cable-boxes, which are common to both types of equipment, are positioned identically; these features facilitate conversion of the switches to circuit-breaker panels should the need arise.

The similarity between this oil-switch and the L-42T switchgear is at once seen

Busbars of 1,200 A or 1,600 A rating are available, they comprise copper rods, tape insulated and covered with bakelised paper sleeves where they pass through moulded supports at the end of the busbar chamber. Compound filling is employed, and the chamber may be of the phase-separated or non-phase separated construction. Selection of switch position and actual operation are by hand, though the closing is spring assisted to ensure safety to the operator. Indication of the switch position is given by a flag indicator on the front panel and neon lamps may be provided which show when the switch is alive. Earthing testing and the usual interlock facilities are provided to ensure safety to the operator. The c.t. chamber is fitted with an adaptor suitable for receiving circuit cable-boxes to take single or 3-core cables.



The fixed and moving contacts are visible in this view of the oil switch

Finishes, Arctic and Tropical

THE stress laid on industrial finishes during and since the war, has led to much research being undertaken to ensure that products are suitably protected against the weather. One of the firms engaged in such activities, ALLWEATHER PAINTS LTD., 36 Gt Queen St, London, W.C.2, have recently announced two new types of paint. The first, Pitan, a cold temperature resistant paint, is said to withstand temperatures as low as −60° F and yet remain flexible, due to the incorporation of a special plasticiser. It is also claimed to be proof against attack by acid or alkali and the destructive effects of brine or ammonia. In view of these properties, it lends itself particularly to use on outdoor equipment such as transformers and switchgear destined for installation in arctic zones.

In contrast, the second is a tropical finish. One of the main difficulties experienced with such finishes is their tendency to brittleness. By using chlorinated rubber as a base instead of the more usual linseed or vegetable oil this problem is said to have been overcome. In addition this base causes the paint to have an impermeable film which is particularly resistant to mould formation. To prevent the attachment of fungi, a mercurial fungicide has been added, and this is said not to have affected the embrittlement characteristics. With both the above products, a normal painting specification of two or three coats suffices.

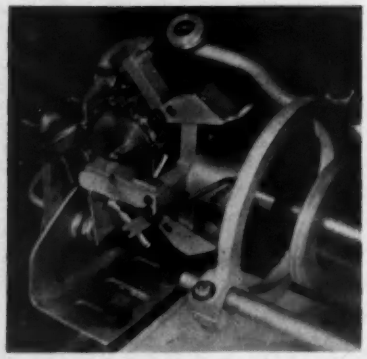
Low Voltage Power Units

THE TRANSFORMER AND ELECTRICAL CO., LTD., Eastern Works, Eastern Road, Walthamstow, E.17, are now manufacturing a wide range of transformer products, from power transformers up to 300 kVA, down to small air-cooled types of only 10 VA rating. Of particular note are the small low voltage power units, which are designed to provide a supply for hand tools, inspection lamps and other forms of portable apparatus, which it is usual to feed with a voltage lower than the mains.

These units are manufactured in sizes ranging from 25 VA to 2 kVA with secondary voltages of 12, 25, 50 or 110 V with centre tap earthed and fuses are fitted in both primary and secondary circuits. The transformer and ancillary equipment is housed within a sheet-steel case having a removable lid to provide access to the fuses. A carrying handle is provided, but the unit may be arranged for wall mounting if required. The input may be taken through ¾ in. conduit or a watertight gland if t.r.s. cable is used. On the secondary side, connection may be made by low-voltage weatherproof plug and socket fitting, t.r.s. cable or conduit. Finish is grey.

Small Armature Winding

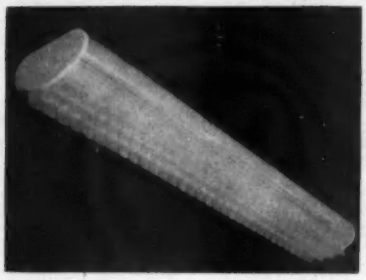
AS a result of recent developments, the MIDLAND DYNAMO CO., LTD., have introduced a new range of four machines which are said to be suitable for winding multi-pole or short-pitch armature, rotor or inverted stator windings. These machines, although primarily intended for use on production should be of equal value in repair shops, since they cover a range of armature sizes from ¾ in. to 6 in. core length and diameter. A feature is said to be the visible laying and easy control of the wire which permits winding the turns neatly and tightly into the slots. A range of wire sizes from 16 to 46 s.w.g. can be accommodated. During the winding operation the armature remains stationary. The winding head illustrated shows the wire guides used with a "Quickway" high-speed production mechanism. The address of the firm is 64 Belgrave Gate, Leicester.



This machine is suitable for winding multi-pole or short-pitch armature, rotor or inverted stator windings

"Cascade" with Straight Louvres

IMMENSE success of their "Cascade" fitting (see ELECTRICAL TIMES, 21 Oct., 1954), has prompted SCEMCO LTD., 6 Soho St, W.1, to develop a new model with straight louvres. Main



New "Cascade" has straight louvres

difference in the models is that the new version has a three row straight "egg-box" louvre in place of the original four row curved louvre.

Prices are £15. 15s. plus 25s. 4d. purchase tax for the 5 ft 80 W twin fitting. £14. 14s. plus 22s. 6d. purchase tax for the 4 ft, 40 W twin fitting. £10. 17s. 6d. plus 13s. 2d. tax for the 2 ft, 40 W twin and £10. 10s. plus 13s. 2d. tax for the 2 ft, 20 W twin version. These prices include all control gear but not fluorescent lamps. Colours peach or pink 10% extra.

Two New "K" Fires

TWO new versions of the "K" contemporary fire which appeared last October are now available in limited supply to order.

J. SCOTT SMITH LTD., 227 South St, Romford, Essex, say that these new fires are the Double K-fire, a "back to back" model, with an element on either side, selling at £7. 10s. 4d. inc. tax and a Triple K-fire, an "all-round" 3 kW fire, with three vertical elements radiating heat in all directions. Price is £8. 19s. 4d. inc. tax.

Both of these models have expanded aluminium guards as on the K-fire. The aluminium frames are in various colours as well as black and have rubber feet to protect floor coverings.

Pressure Type Cable Terminals

TWO new types of solderless wiring terminals are now available from HELLERMAN LTD., Tinsley Lane, Crawley, Sussex.

The wire crimp type fixes on to the conductor only and is available in ring and spade ends for conductors 0·25 in. to ·050 in.; ·050 in. to ·064 in.; ·064 in to ·10 in. stud sizes 0, 2, 4 and 6 BA. Twin grip terminals as their name implies crimp on to both conductor and cable insulator and in similar stud sizes are available for cables with diameter over insulation ·105 in. to ·140 in.; ·115 in to ·170 in.; ·150 in. to ·230 in.

Specially designed fitting tools in four "marks" are available for fixing these terminal ends.

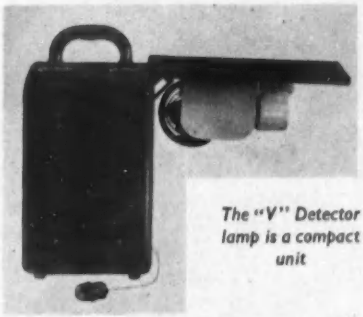
U.V. Detector Lamp

A NEW multi-purpose detector lamp unit has recently been designed by "V" (DEVELOPMENT AND TRADING) LTD., 22 Clifton Rd, W.9.

Measuring 6 in. x 7 in. x 10¼ in. and weighing about 9 lb., the unit comprises a 75 W or 120 W high pressure mercury vapour lamp with "Violet Black" glass, porcelain e.s. lampholder, special ballast resistance tapped for 220/250 V, shield-reflector, 9 ft flex and plug, all compactly fitted into a carrier covered in hard-wearing leatherette and provided with a robust handle.

The unit can be used for close radiation when determining forgeries, for detecting changes in organic or inorganic materials, and similar uses.

It can also be used for distant radiation in disclosing skin or other human or animal diseases and for activating all kinds of fluorescent materials. It is also



The "V" Detector lamp is a compact unit

useful in effect illuminations for the theatre, window displays and publicity, the radiation being powerful even at a distance of 30 to 50 yds.

The average life of the lamp is 2,000 hours and it can be easily replaced when necessary. Price for the complete unit is 75 W, £10. 15s.; 120 W, £11. 10s. Both units free of purchase tax.

The "Mixmaster" is Back

FAMOUS in pre-war days the "Mixmaster" kitchen machine is now available once more in this country.

Having opened a factory near Glasgow, SUNBEAM ELECTRIC LTD., 14-16 Old Quebec St, W.1, are now making there, the "Mixmaster" and many other appliances soon to arrive on the market.

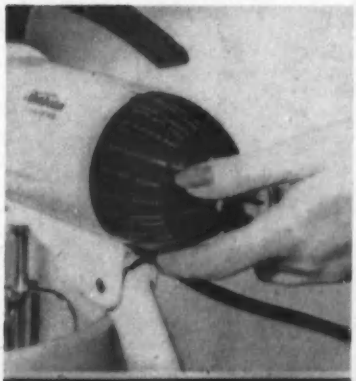
Major selling point of the "Mixmaster" is its mixfinder dial, an unusual and attractive part of the design. On this moulded end cap every mixing speed is plainly marked so that with this easy set easy to use dial there is no need to refer back to recipe books for every change of speed.

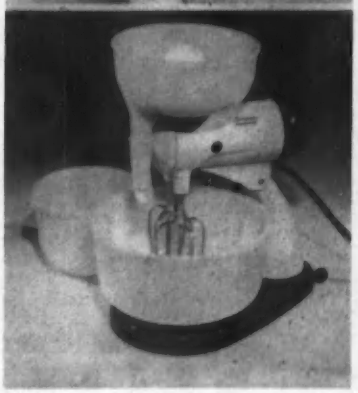
Second feature are the bowl-fit beaters —the larger outside beater is curved to fit the contour of the bowl all the way to the bottom whilst the inside beater is shaped to cover the flat bottom of the bowl to the centre. These ensure that all the mixture goes through the beaters. Automatic bowl-speed control is the third feature giving uniform low speed in correct relation to the beater speed. There is no hand turning or slowing down required. One of the beaters has a nylon button which contacts the inside of the bowl. Both bowls are heat-resistant, the larger holds 6 pints whilst the smaller is large enough to whip 6 egg whites.

The Mixmaster also incorporates a unique lever mechanism permitting the beaters to be adjusted to suit either bowl, whilst an automatic ejector mechanism ejects the beaters when the handle is tilted to one side.

The juice extractor has an oscillating strainer which helps extract juice from the fruit-pulp and is the forerunner of a series of attachments which will include a meat chopper and grinder, a slicer and shredder, a drink mixer and a blender.

The Mixmaster has a "Mixfinder" dial and below, one of the series of accessories





For the Electrical Trade

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Fluorescent Hand Lamps

SHOCK-RESISTING and waterproof fluorescent hand lamps are now marketed by the BRITISH CENTRAL ELECTRICAL CO., LTD., 6-8 Rosebery Ave, E.C.4.

There are three types, a single lamp general purpose type with one 8 W tube giving 360 lumens light output which, measuring 14 in. long x 1½ in. diameter, is fitted with rubber end caps and transparent plastic envelopes. There is a reflector fitted to prevent glare. The handlamp is complete with rubber housed control gear, a clamp with rubber covered jaws and ball joint and 20 ft of cable. It costs £6. 3s. 6d. net. Purchase tax on lamp is 1s. 8½d. extra.

A double lamp pattern housing two 6 W lamps (430 lumens) and measuring 11½ in. x 2¾ in. diameter costs £6. 15s. each net. Purchase tax on lamps 2s. 11d. extra.

Completing the new range is a barrel inspection lamp with one 8 W tube giving 360 lumens. Its overall length is 39 in. but longer handles can be supplied. Price complete is £8. 5s. 6d. net, with purchase tax on lamp 1s. 8½d. extra.

Osram Colour Glazed Lamps

A RANGE of colour glazed lamps is a new line by the GENERAL ELECTRICAL CO., LTD., Magnet Hse, Kingsway, W.C.2. These are particularly suitable for outdoor decorative lighting and are available in 15 and 25 W ratings coloured red, blue, green, yellow, orange and white at 1s. 9½d. (Purchase tax 4d.)

The coating, which withstands the effects of atmospheric attack, consists of a suspension of powdered low melting point glass in a suitable binding to which a colouring medium has been added. This coating is dried on the glass envelope and then fired causing it to fuse to the envelope. Light transmission losses are said to be reduced by this method.

New Prices for "Swan" Holloware

PRICE increases for "Swan Brand" ground base holloware are announced by BULPITT AND SONS LTD., Swansea Works, Birmingham 1. These have effect as from 31 Jan. this year and are detailed in leaflet 219 to be used in conjunction with the No. 77 Catalogue and 218 illustrated leaflet.

Included in the new prices is the extra involved in reverting to the pre-war trade discount of 33⅓% which came into effect on 1 Feb., 1955. The company stress that these price changes and trade discount changes apply only to the ground base holloware and not to the range of electrical domestic appliances.

Low Price Tape Recorder

NEW lightweight portable tape recorder A.G.8105, the "Recordergram," is announced by PHILIPS ELECTRICAL LTD., Century Hse, Shaftesbury Ave, W.C.2, to retail at 35 guineas complete.

Accessories include Philips crystal microphone, 600 ft reel of high quality tape and a spare 5 in. diameter take up reel. The instrument is housed in a neat grey case measuring 13¾ in. x 10 in. x 7 in. and weighs 21 lb. All accessories are in cream and can conveniently be stowed away in the lid of the case when not in use. In addition, this compact tape recorder can also be used in conjunction with the Philips "Disc Jockey" or other record player as an ordinary amplifier.

One main control knob is employed which can be turned to different positions, clearly indicated, to control recorder off; amplifier on; fast wind; fast re-wind (80 sec for 600 ft tape) playback; record. The other two simple controls are for playback volume and control of recording level.

With consumption less than 60 W for a.c. mains, 50 c/s, 110-150 and 200-250 V the "Recordergram" provides all facilities of tape recording at a very moderate cost. Tape speed is 3¾ in. per sec, which with twin track recording gives a playback time of 2 x 30 min. The instrument employs a new dot and line indicator (DM 71) for visual control of recording levels.

This new display package has been designed by Revo Electric for their Automatic iron. Printed in three colours the box not only serves the purpose of a container but is designed to make a useful display stand for sales purposes. Price of the new iron is 45/-, loading is 650 W

Bulk Tape Eraser

SUITABLE for use with the Grundig "Stenorette" tape spools, the bulk erasing units type 102 and 103 by HARVEY ELECTRONICS LTD., 273 Farnborough Rd, Farnborough, Hants, enable business men to ensure that their previous recordings are quickly erased and spools re-used.

Two types, 102 and 103 enable the erasing of any recordings on ¼ in. tape to be complete in about 10 seconds with tape left in a neutral condition.

Where a tape has been over recorded or the erase head is functioning imperfectly and in cases where the erasing relies on the h.f. bias in the recording head, this bulk eraser will ensure a perfectly quiet background in soft passages and will enable a better quality reproduction.

In operation the spool to be treated is placed on the insulated deck, rotated slowly twice on both sides, when it will be completely de-magnetised and neutral.

Type 102 (for 7 in. spools) in a steel case, cellulosed hammer finish with plastic deck and stainless steel spindle, for voltages 200/250 V, 50/60 cycles, and consuming 2-5 amps, £7. 10s. Type 103 is similar but is for 100/130 V 50/60 c/s, and is also priced £7. 10s. Size of both units is 9 in. x 6 in. x 4½ in. high overall. Weight 7¼ lb.

"Photoflux" Cap'ess Flashbulb

AVAILABLE on the 15th of this month the new "Photoflux" capless flashbulbs represent an important advance in flash photography technique.

Selling at 8d. each list price and supplied in packets of 10 which can be split into fives, the P.F.1 capless flashbulb has a light output 20% more than P.F.3 of 6,500 lumen/seconds, giving a guide number of 180 on high speed panchro film. P.F.1 reaches peak 18 milliseconds after contact and can be used with snapshot cameras or with fully synchronised "M" shutters on professional equipment.

PHILIPS ELECTRICAL LTD., Century Hse, Shaftesbury Ave, W.C.2, say that they have produced for use with the P.F.1 a special adaptor with ejector mechanism which can be used with any flashgun made to take normal ASCC flashbulbs. The adaptor costs 1s. 6d.

TRADE PUBLICATIONS

RELAYS.—The Record Electrical Co., Ltd., Broadheath, Altrincham, Cheshire, has published a brochure giving an account of the moving coil relays they manufacture.

CENTRIFUGES.—Sharples Centrifuges Ltd., of Tower Hse, Woodchester Stroud, Glos, have just issued a bulletin No. 1654 which shows their range of supercentrifuges.

POWER ENGINEERING.—The Welmec Corporation Ltd., 147 Strand, W.C.2, sole agents for the German firm A.E.G., are now able to supply copies of A.E.G.'s Handbook at £2. 2s. each.

STEEL CASTINGS.—A new booklet on steel castings recently produced by the North British Steel Foundry Ltd., Bathgate, Scotland, has been designed both as a catalogue and reference book on steel castings.

MILL EQUIPMENT. G534 new brochure from International Combustion Products Ltd., 19 Woburn Place, W.C.1, deals with the uses of the Hardinge Conical Ball Mill in ore production.

INSTRUMENTS.—Leaflets describing two dual purpose set squares and a similar parallel rule are available from Proportional Instruments Ltd., 14 St James St, Brighton 1.

WELDING.—Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17, have now issued a pocket Electrode Guide to the range of Metrovick welding electrodes.

TERMINALS.—A loose-leaf catalogue of cable lugs, solderless terminals, crimping tools and crimping equipment is available from Erma Ltd., Hong Kong Works, Exhibition Grounds, Wembley, Middx.

Developments in S. Rhodesia

ELECTRICITY SUPPLY COMMISSION HAS AN ACTIVE YEAR

EXCLUDING a temporary bulk supply to the City of Salisbury, the Electricity Supply Commission of Southern Rhodesia sold 435 million units during the year ended 31 March, 1954—an increase of 15·49%, compared with 19·36% in the previous year. Although all consumer classes achieved increases, the closure of a number of mines and of the R.A.F. stations in the Colony adversely affected the year's sales, Mr A. B. Cohen, O.B.E., M.I.E.E., the chairman, reports. Sales to mining consumers amounted to 231·8 million units, to municipalities 99·3 millions, and to industrial undertakings 95·5 million units (an increase of 49%). Domestic and lighting supplies took 21·4 million units (an increase of 25·2%), while farms accounted for 18·9 million units.

It would seem, from the report covering the period, that the Commission had a very active year, although it resulted in an excess of expenditure over revenue of £78,996. But a 20 MW generating set was placed in service at Umniati, while 103·65 miles of 88 kV and 41 miles of 33 kV transmission line were erected during the period. Some of the transmission line replaced lower voltage lines; the permanent closure of some mines necessitated the dismantling of 93 miles of distribution line. There were, in fact, 28 fewer mining connections at the end of the year covered by the report, reducing the number to 456.

Farming Problem

Farming consumers at 2,032 showed an increase of 145 over the previous year. The average increased consumption per farm connected was 20·85%, which may be considered fairly satisfactory, but since a farm, from the Commission's point of view, is both a residence (domestic supply) and a business (power supply) far too many farms restrict their supply to the former, it is stated. Even in this category many are comparatively poor consumers measured by urban standards. The particular exception are dairy farms, which are regarded as model users of electricity in their businesses.

Two matters which caused the commission concern during the year were tariffs, and coal supplies. With an average revenue per unit sold of 0·943d., and an average cost of 0·983d. it became obvious that revisions were necessary, and application was made for increases in all standard tariffs, averaging approximately 25%. The coal difficulty was really a continuation of the trend in evidence for the past few years—a deterioration in the grading and quality, and an increase in the price of coal delivered, mainly because of higher haulage charges.

The Bulawayo City Council and the Commission have agreed in principle to interconnect the former's power station with the Central Undertaking of the Commission, the aim being, firstly to pool reserve plant, and also to effect economies in operation for both undertakings. Depending on the rate of load development it is expected that the interconnector will be required by 1959. The line will be constructed by the Commission and its capacity and characteristics so designed that it would be in conformity with the main transmission system based on hydro-electric power supply. (This is obviously in anticipation that either the Kafue or Kariba Gorge hydro-electric project will soon be started.)

On the power development side, the principal work was at Umniati "B" generating station, where another 20 MW set and three boilers were commissioned. A further 60 MW of plant was in course of erection or on order to bring the station up to its designed capacity of 120 MW. Extensions were also being made at the Shabani No. 4 power station, which is expected to be in operation in a few months' time.

Finally, there is reference to the formation of the Federal Government for Rhodesia and Nyasaland, as the result of which the Commission will be placed under its aegis. The opportunity is taken to include in the annual report some details of the operational record of the Commission since its inception in 1936. It is evident that in the face of innumerable difficulties, considerable progress has been made, particularly since 1947, of which the Commission may be proud.

Electricity in the 'Ark Royal'

WITH the imminent commissioning of H.M.S. *Ark Royal*, the first aircraft carrier to embody all the post-war techniques developed for handling and operating modern types of aircraft, the Admiralty has released some information on the services provided on board.

Some 808 ft long and with a breadth on the waterline of 112 ft 9 in., the *Ark Royal* will displace 36,800 tons as compared with the 23,000 tons of H.M.S. *Illustrious*. In constructing the hull, electrical welding has been used on the widest possible scale to provide the lightest and strongest possible structure, but there still remain many parts of the warship in which the highest quality of the riveter's art has proved essential.

Electrical Installation

As would be expected, the electrical system of the aircraft-carrier is large and comprehensive. The main supply system involves some 750 miles of cable weighing 1,100 tons and includes about one million connections. A generating capacity of 4 MW has been provided. There are four steam turbine-driven and four diesel-driven sets, each rated at 500 kW, dispersed throughout the ship to minimise the effects of action damage. Distribution of electrical power is by a 220 V ring main system, incorporating about 350 electrically operated circuit-breakers, and control of the system is effected from a large main switchboard, but in emergency four smaller switchboards each controlling one quarter of the ship can be utilised.

The number of motors installed is over 1,000 and they range in size from 170 h.p. machines, driving the forward capstans, down to f.h.p. motors for such varied services as ice-cream making, workshop tools, oil purification and air conditioning. Nearly 600 of these motors are used for driving ventilation fans.

Galleys, bakery and laundry, which, under peacetime complement must provide for 110 officers and 1,522 ratings with an additional 100 officers and between 450 to 500 ratings when front-line aircraft are embarked, are all-electric. Many labour-saving devices are included. Machines for pie-making and dough-kneading, dish-washers, potato-peelers, chippers, mincers and slicers are installed for food-preparation, while in the laundry are washing, starching, and both flatwork and collar ironing facilities.

About 10,000 lighting points are installed, 3,000 of which are fitted with twin 20 W fluorescent lamps. Part of this installation consists of red lighting to allow for rapid adaption of vision at night. Emergency lanterns are automatically brought into action in the event of failure of mains power.

To service and start naval aircraft, the flight deck and hangars are provided with socket outlets fed from fixed motor generators, together with their associated control gear. This method obviates the need for the more cumbersome batteries and trolleys.

Electrical communications are of great importance, and some 1,500 telephones are installed, 500 as outstations on an automatic exchange and the remainder, mostly sound powered, as outstations on direct telephone systems. Where necessary, amplified speech communications operating loudspeakers are installed for the passing of general information warning signals and other intelligence. This system involves about 600 loudspeakers. Entertainment facilities have also been provided.

NEWS OF THE WEEK

Big Export Market in S. America

VENEZUELA AND COLOMBIA ARE BEST MARKETS AT PRESENT

GENUINE enthusiasm among manufacturers to export to S. America resulted in a spirited discussion at one of the most successful and well-attended meetings ever sponsored by the Institute of Export. The meeting took place at Caxton Hall, Westminster, last week, when Mr J. P. Ford, sales director of the Brush Group gave his considered impressions of his three-months tour of Latin America. It will be recalled that Mr Ford held a Press Conference on his return to this country, and his remarks on that occasion were reported in our 30 December issue. One of Mr Ford's main warnings was that demand in the states he visited was for capital equipment, and consequently the U.K. had to get into the market now or be prepared to be frozen out for some 20 years to come. As regards competition he said he had met four German representatives travelling round the Continent for every one British representative, with obvious results.

The two really difficult markets, mainly because of the shortage of sterling, were Brazil and Chile. In both cases, Mr Ford suggested that Britain should help them to earn more sterling in order to enable them to buy from us. Their exporters and our importers could get closer together, he maintained. Chile was the S. American Sweden, and Brazil was the S. American Canada. He was convinced that Brazil was Britain's largest long-term market in S. America.

At the present time Venezuela offered the best prospects for the potential U.K. exporter. Vast development schemes were being planned or inaugurated and there was an excellent opportunity not only to export goods but also services of contractors and consulting engineers. Only a short time ago, incidentally, a firm of British consulting engineers had been appointed as contractors for the Caroni River hydro scheme. Similar development was taking place in Colombia with equal opportunities presenting themselves. Mr Ford drew attention to Peru which, he said, had been virtually ignored to date for no good reason.

One of the notable facts about the discussion which followed Mr Ford's address was the number of small manufacturers willing and anxious to tackle the Latin-American markets. Help was offered them by the Institute of Export, and of particular note was the suggestion that manufacturers should establish joint selling groups.

Wage Claim for Electricians

THE Electrical Trades Union has rejected an offer of 2d. an hour for electricians in the electrical contracting industry, made by the National Federated Electrical Association. The E.T.U. had submitted a claim for a "substantial increase" in pay for journeyman electricians and others. An offer by the Association to submit the claim to arbitration was not accepted by the E.T.U. The union is calling a delegate conference to consult the next step.

B.E.A. BORROWINGS STAND AT £120M

THE Treasury has issued a further statement of guarantee in respect of temporary borrowings by the B.E.A. from Clearing Banks and Scottish Banks or other persons. The amount involved is £120 million and the guarantee is valid in the quarter ending 31 Mar. The statement replaces that of 24 Sept.

New Committee formed to advise on Entry of Duty-Free Machinery

FOLLOWING the report of the Wilson Smith Committee, a consultative committee on the Duty-Free Entry of Machinery has been set up by the Board of Trade. This is in accordance with one of the committee's recommendations and was foreshadowed in the Minister's statement on the report in the House on 29 July last. The purpose of this consultative committee will be to review the broad policy followed by administrative department, to consider problems arising, and to represent industry's views to the administrators. The committee comprises six industrialists, three with experience as makers of machinery and three with experience as users, as well as a trade unionist and representatives of the B.o.T. and Ministry of Supply.

The duty-free licensing of machinery was resumed on 4 Aug. The findings of the Wilson Smith Committee were reported in our issue of 29 July. The following week we reported the Government's acceptance of all the recommendations except one. That concerned the extension of duty-free provisions to cover plant, and a decision was postponed on the matter because it would involve legislation. Discussions on this point will be one of the tasks of the newly formed consultative committee.

Increased Fees for Patents and Designs

HIGHER renewal fees will be charged for patents and designs registrations due to expire after 30 Apr. After that date also there will be a general increase in fees payable in respect of a number of patents and designs matters. Revised rules have been laid before Parliament by the Board of Trade. The revisions have been made to make them conform to the requirements of the European Convention held in December 1953, relating to formalities required for patent applications. As regards the fees, these have remained substantially unchanged for many years now.

Clean Air Bill promised by the Government

A PRIVATE member's bill to implement some of the recommendations of the Beaver Committee's report on air pollution was withdrawn after debate in the House of Commons on Friday last. Mr Gerald Nabarro sponsored the Bill, and he withdrew it after Mr Duncan Sandys, Minister of Housing and Local Government had undertaken to introduce an official Government Bill on the same subject later this session. In giving this undertaking, the Minister promised that the bill would follow the general lines of the recommendations of the Beaver Committee. He warned, however, that whether the bill would get through all its stages in the present session depended largely on how far it proved to be a measure acceptable to all the parties.

In the course of the debate on Mr Nabarro's bill, there was some concern with the insufficiency of smokeless fuel supplies if it became an offence to burn bituminous fuels, and also with the availability of sufficient engineers and other technologists to implement and administer the requirements. In asking for withdrawal of the bill, Mr Sandys took up this latter point, and underlined the need for full consultations with local authorities and with industry before legislative proposals were finalised. He reserved for the Government the right to propose methods alternative and additional to those put forward by Sir Hugh Beaver and his committee.

E.C.A. and S.W. Board co-operate to Sell Cookers

Sales Agreement is Third Since November

A CO-OPERATIVE sales scheme whereby contractors can enjoy the same hire-purchase facilities offered by the Area Board has been introduced in the S. Western Electricity Board's Area. The completion of negotiations and their implementation was announced by the Board's chairman, Mr S. F. Steward, at the annual dinner of the Bristol branch of E.C.A. last Friday. It will be recalled that similar schemes were introduced some two months ago in the Midlands and North-West. Terms agreed by the S. Western Board cover all cooker business secured and introduced by members of the E.C.A. Any one contractor whose introductions result in the connection of ten or more cookers in a year will receive a flat commission of 10% on the list price of the cookers. If a contractor sells under ten cookers through this arrangement his rate of commission will be 7½%. As regards installation, the private retailer can undertake connection himself but must carry out the work on the Board's terms and to their specifications.

As in other areas where these co-operative schemes have been introduced, the arrangement has been welcomed by the private traders, particularly the smaller concerns. It will enable them to offer better hire purchase terms and thus step up sales. They will be assisted in renewing their efforts to sell these appliances by the supply of various display materials offered by the Board. The greater the cooker sales, the greater the amount of electricity consumed, resulting in satisfaction for the Board.

Proposing the toast of the Association, Mr Steward said the demand for modern electrical equipment provided unique opportunities for joint service to the public by the Board and private electrical contractors. He said he was sure that by united effort the electrical industry would be able to give even better service to the public.

OFFICIAL PUBLICATIONS

MINES. Report of H.M. Inspector of Factories for Scottish Division for 1953. H.M.S.O. 2s. Also report of H.M. Inspector for 1953 respecting S.W. Div. H.M.S.O. 1s.

STATEMENT OF GUARANTEE given by Treasury respecting loans of B.E.A. (see page 244). H.M.S.O. 2d.

OVERSEAS ECONOMIC SURVEY. Switzerland. H.M.S.O. 4s. 6d.

NATIONAL RESEARCH DEVELOPMENT CORPORATION. Annual report and accounts for 1953-54 (see page 222) H.M.S.O. 9d.

BRITISH STANDARDS. B.S. G.146, 1955: D.C. Motors for Aircraft; B.S. G.147, 1955: A.C. Motors for Aircraft, part 1, 3-phase 400 c/s squirrel-cage induction motors.

Nine Acres bought for Factory Extension

FURTHER expansion of facilities for making Ferguson television receivers and Atlas lighting equipment is announced by Thorn Electrical Industries Ltd. The company has just acquired another nine acres of land at Enfield, Middlesex. The site is very near the company's existing factory and work is expected to begin on an 80,000 sq ft building shortly. Plans include the erection of a four-storey warehouse, improved amenities for employees, canteen facilities, and a new electronics laboratory for research into colour TV and cathode-ray tubes. Designed in contemporary style with glass and coloured tile exterior, the laboratory will be specially air-conditioned.

E.M.I. Expansion in Electronics Field

CONSIDERABLE expansion in the activities of the E.M.I. Group in the field of commercial and industrial electronics are envisaged following the change in name of Emitron Television Ltd. to E.M.I. Electronics Ltd. The new company will be a controlling and co-ordinating concern absorbing the three existing companies as subsidiaries. It will be concerned with the design, development and marketing of all electronic devices other than those for Government requirements. Among the activities of the new company will be the rapidly extending developments of electronic computation. Research into colour television will also be prominent in the industrial programme.

THERE IS ANXIETY IN OPPOSITION'S CAMP

THE gas industry is concerned at the decrease in consumption over the last two or three years. Dr R. S. Edwards, chairman of the N.E. Gas Board, told the Gas Consultative Council in Leeds last week that in their area the substantial increases in industrial and commercial use of gas had been outweighed by the fall in sales per domestic consumer.

One of the explanations offered was the fact that new gas cookers replacing the older models were more efficient and estimated to consume 15 therms a year less. There were also changes in consumer habits, said Dr Edwards—great developments in works and school canteens. The Board was endeavouring to check the fall by more advertising, extension of hire purchase terms and the encouragement of new uses of gas. He added there were signs of a halt in the downward trend.

E.C.A. to Confer at Margate

IT was officially announced last week-end that the E.C.A.'s 1955 Annual Conference will take place at Margate. Registration will be on Sunday, 5 June, and the business sessions will be on the two following days. Details of the programme have not yet been finalised.

Catering to be Featured by N. of Scotland Board

A SERIES of demonstrations and talks will take place in the Music Hall, Union St, Aberdeen, throughout next week. The event is being sponsored by the N. of Scotland Hydro-Electric Board and will be entitled Commercial Catering by Electricity. Demand for electrical catering equipment has risen rapidly in recent years. In fact since 1948, over 400 Highland hotels and boarding houses have installed electricity. The Board's deputy chairman, Sir Hugh Mackenzie will open proceedings on Monday afternoon. It is said that the event will be the largest and most comprehensive show of its kind ever held in Northern Scotland. It closes on 18 Feb.

Charge Engineers' Meeting

EIGHTH meeting of the Charge Engineers Society in the London Division of B.E.A. will take place at Marconi Hse in the Strand on 15 Mar. This meeting is being held at the invitation of the English Electric Co., whose Mr N. D. Peacock will speak on Power Station Auxiliary Switchgear. Proceedings start at 5.30 p.m. The idea to form such a society originated last year at Horsley Towers, the Authority's training establishment in Surrey.

BANGKOK'S PICCADILLY

Facing the new Odeon Theatre in the heart of Bangkok at the intersection of six thoroughfares is this 13 ft x 10 ft replica of the G.E.C. de luxe 8 cu ft refrigerator. The neon sign was erected by the company's agents, The Thai-British Trading Co. Ltd. The sign has a solid metal background on which are painted interior details of the appliance, the whole being outlined by white and green neon tubing. The 4 ft letters surmounting the sign are outlined in red

Purchasing Officers organise Sixth Minibition

THE Purchasing Officers' Association are to hold their 1955 National Conference at Cliftonville, and for the sixth year there will be the popular Minibition at the Winter Gardens. Actual dates will be 29 Sep. to 1 Oct. Last year's displays in the specially designed stands were generally agreed to have reached a new high standard. Although there will be more space available at Cliftonville than at Harrogate in 1954, most of the space has already been booked and any firms who have not yet applied are advised to do so without delay. There are two styles of stand measuring some 6½ ft in height, 3 ft in depth and 5 ft wide. Charge is £20.

Programme for 1956 World Power Conference

ATOMIC energy is to be the subject of a separate section at the Fifth Plenary World Power Conference, to be held at Vienna from 17 to 23 June, 1956. In this section reports on the technical problems of designing and operating reactors for producing electric power and the discussion of problems concerned with making them economic, will receive the greatest attention. This is announced in the technical programme of the Conference, issued last week by the Austrian National Committee.

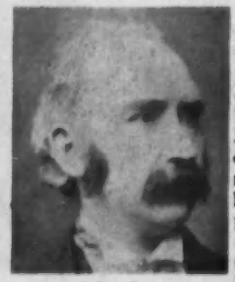
Theme of the Conference is to be "World energy resources in the light of recent technical and economic developments." There are five main divisions, as follows: (1) The state and development of power production and utilisation in individual countries. (2) The preparation and conversion of fuels. (3) Utilisation of primary resources of energy. (4) Purification of waste water and waste gas in the production and use of energy. (5) International collaboration in the production and use of energy.

Division 3 is expected to include papers of particular electrical interest. Besides atomic energy, thermal and hydro power stations are to be the subject of special sections, with close attention to integrated processes in which various kinds of heat engine are combined to form a single unit, e.g., steam boilers with gas turbines.

A British Papers Committee has been set up in connection with the conference, its electrical members including amongst others Mr J. Eccles (chairman) and Messrs J. Beard, H. G. Nelson, V. A. Pask and J. S. Pickles. Communications for this committee should be sent to the secretary, British National Committee, World Power Conference, 201 Grand Buildings, Trafalgar Sq, London, W.C.2.

ELECTRICAL FIRM REACHES 100th ANNIVERSARY

IT IS a notable occasion when any company attains its 100th birthday but the landmark gains added significance when the firm is an electrical concern. Celebrating the centenary of their foundation this month are Julius Sax and Co., Ltd., now permanently installed in their own new and modern factory at Brentford. Mr Julius Sax first came into prominence when he was employed by Prof Graham, Master of the Royal Mint, to build automaton and other balances for use in the Mint. Later he turned his attention to the invention of various telegraphic, telephonic and scientific electrical instruments. It was in 1855 that he began manufacturing electric bells, indicators, fire alarms and similar apparatus. At that time the company occupied premises in Great Russell St, London. Among Mr Sax's numerous inventions were an electro-magnetic telephone, a workman's tell-tale clock, electric call bells and fire alarms adopted by the Police and Fire Brigade.



Julius Sax

The turn of the century saw the firm's move to Camberwell and six years later to more imposing premises in the High St, Bloomsbury. At that stage there was a shopfront and two workrooms occupied by some dozen employees. A far more spectacular move was made in 1927. The company moved to a factory at Hammersmith where apart from some 6,000 sq ft of working space there were offices and a growth in numbers to some 50 employees. The firm's latest move was in 1948 when they occupied a modern and impressive new works at Brentford. Factory area now amounts to about 2,000 sq ft with modern offices and all the various subsidiary departments which are gradually making the organisation independent. There is room for expansion and it is hoped to embark on these plans as soon as possible. From the few helpers in Great Russell St the pay-roll is now about 100.

The company now makes a wide range of electric bells, indicators, call systems, transformers, fire alarms, bell pushes, trickle chargers and associated equipment. The order book is well filled with a fair proportion of goods going overseas.

The First Half-Century

At the monthly meeting of Monmouth Town Council, the Electric Lighting Committee submitted a report recommending that a 5% discount should be allowed to consumers who paid within one month, and that an additional amount equivalent to another 5% should be given in lamps, at the discretion of the engineer, or a total equivalent of 10% all round. In reply to questions, the engineer pointed out the difficulties of the latter half of the system from the official's point of view, and after considerable discussion it was decided to ask the engineer to submit a report upon the whole question of finance concerning the department.—*From our issue of 9th Feb., 1905.*

E.I.B.A. CELEBRATES GOLDEN JUBILEE IN APRIL

IT IS now fifty years since the day early in 1905 when a small handful of people met to found a benevolent fund to assist members of the electrical industry. Known then as the Electrical Trades Benevolent Institution, the organisation is now famous under its initials E.I.B.A. The jubilee is to be celebrated with a luncheon at the Connaught Rooms, London, W.C.2, on 19 Apr. Principal guest will be Sir John Maud, permanent secretary to Ministry of Fuel and Power. Sir John Dalton, president of the Association, will receive guests at 12.30 p.m. Tickets at £1. 1s. may be obtained from the secretary at 32 Old Burlington St, W.1.

In all but the ambitious financial hopes, E.I.B.A. has developed well beyond the plans of its founders. Financially, it was hoped that invested funds would be not less than one-thousandth of the capital invested in the electrical industry. Unfortunately for that ambition, the electrical industry has progressed much too fast. In fact, E.I.B.A. investments are a little over £100,000.

A section of the Henley Exhibition being held now at the Russell Hotel, London, W.C.1. A description of the exhibition was given in these columns last week. It closes on 25 February

Banqueting suite at The Criterion, London. Note the concealed lighting, wall fittings and chandelier

Colour and Lighting Feature in Hotel Suite

ONE of the most impressive banqueting suites in London must be the Grand and Victoria Halls at The Criterion in Piccadilly now that it has been redecorated and re-illuminated. Colouring chosen for the suite is a scheme from the S.A.C. Division of Arthur Sanderson and Sons Ltd., and is predominantly pastel pink. To this has been added a concealed lighting installation involving some 925 Colourglaze lamps supplied by Crompton Parkinson Ltd. They are situated behind an ornamental fringe running round the walls of the suite. The lamps have been arranged so that each of the six different colours of lamps can be switched on in sequence, in addition to dimming effects.

This general scheme has been supplemented by spotlight decorative wall lights located at intervals round the ballroom, and by a large chandelier in the centre of the main room. The latter is remarkable because it can be lowered from or drawn into the cupola ceiling as required.

R.C.E.E.A. Members' Exports achieve New Records

ANNUAL meeting and luncheon of the Radio Communication and Electronic Engineering Association took place recently in London. At the latter function, the retiring chairman, Mr C. G. White asked what developments would follow the now permanent exchange of television programmes between Britain and the Continent. He suggested the next stage was a transatlantic exchange and then a two-way penetration of the iron curtain.

On the subject of exports, Mr White said that last year's exports by association members had again beaten previous records. Exports amounted to £12·8m whilst indirect exports such as equipment in ships and aircraft amounted to £5m. These figures compared with £11m and £4m the previous year.

The question of appropriate machinery for handling frequency utilisation and allocation problems was still unresolved, he said. Other problems Mr White mentioned involved electronic equipment in aviation and the serious shortage of suitably qualified technicians.

Order from S. Africa

IT was announced last week that Brush Electrical Engineering Co., Ltd., have received an order for electric motors, totalling 4,800 h.p., from Vaal Reefs Exploration and Mining Co., Ltd. The order was placed through Brush Aboe (Southern Africa) Ltd., the Brush group's subsidiary company in Johannesburg.

Rail Track Agreement

IT has been announced by Kennion, Irvine and Co., Ltd., that they have concluded arrangements under which they will be in a position to supply certain items of specialised railway track equipment. This includes "Vibromax" electric railway ballast tampers, Solus-Schall ultrasonic cathode ray rail flaw detectors, Schorling rail surface grinding machines. These are of foreign origin but the agreements mainly envisage their manufacture at home if not already produced in Britain.

High Court Action

A CASE heard recently in the Queen's Bench in which the plaintiff was said to have sustained X-ray burns while in the employ of G. A. Harvey Ltd., was described by counsel as the first of its kind. As a result of his injuries the plaintiff lost first his hand and then half his arm. The accident occurred in 1949 but the case was delayed pending stabilisation of the injury. In the course of evidence (the case extended over four days) it was alleged that some firms were employing operators on X-ray examinations with the title of radiologists. In certain cases employers thus gained the impression that due care was being taken, whereas the operator in charge of X-raying had in fact no real training and no qualifications. The case was proved, with no contributory negligence on the plaintiff's part. The sum of £4,000 was awarded. Defendants have stated that they will appeal.

USE OF ISOTOPES FOR INDUSTRIAL PURPOSES

SOME of the ways in which atomic energy is being harnessed for industry are to be demonstrated in Birmingham in the next two weeks. A special exhibition, "The Atom in Industry", will be opened at the Birmingham Exchange and Engineering Centre on Monday, 14 Feb., by Dr Henry Seligman, director of the Isotopes Division at the A.E.R.E., Harwell. It closes on 26 Feb. The show has been devised by experts from the Isotope Division, and a number of industrial firms who make equipment for work with radioactive isotopes will be participating. The exhibition is mainly concerned with the many ways in which these radioactive materials can be used for industrial purposes. One of the demonstrations will show how wear on bearings or moving parts can be measured in a few hours without having to dismantle an engine.

Contract Commitments

THE B.E.A. have entered into commitments to place the following contracts for boilers and condensing and feed heating plants associated with 60,000 kW turbo-alternators for new power stations in construction programmes for 1959, 1960 and 1961:

BOILERS		1959	1960	1961
Foster Wheeler Ltd.				
Aberthaw ...	3 × 755,000 lb/hr	1	1	1
Mitchell Engineering Ltd.				
Portishead ...	4 × 300,000 lb/hr	2	2	–
Skelton Grange	4 × 550,000 lb/hr	1	2	1
Uskmouth B	4 × 550,000 lb/hr	1	1	2
John Brown Land Boilers Ltd.				
Belvedere ...	6 × 550,000 lb/hr	2	2	2
Elland	2 × 550,000 lb/hr	1	1	–

CONDENSING AND FEED HEATING PLANTS			
Vickers-Armstrong Ltd.			
Elland	1	1	–
Uskmouth B	1	1	2
Belvedere	2	2	2
Marchwood	1	2	–

NEWS IN BRIEF

New equipment introduced by E. K. Cole Ltd. will enable advertising agents and others interested in commercial TV to present films to their clients as they will be seen by a home audience. Equipment is portable and facilitates on-the-spot correction.

Use of electricity in the dairy and particularly its low cost will be the main theme of the E.D.A. and S.E. Scotland Board stand at the Scottish Dairy Show in Glasgow next week.

The Danish firm, Danfoss Manufacturing Co., is arranging a special meeting in London on 14 Mar. for all those interested in heating. The final programme has not yet been compiled but there will be a lecture, illustrated by lantern slides, a new 45-min. Danfoss film, and a comprehensive exhibition of the company's products.

QUESTIONS IN PARLIAMENT

Welsh H.E. Bill

SECOND reading of the N. Wales Hydro-Electric Power Bill took place in the House of Lords last week. Lord Chorley asked that the committee on the Bill should give due consideration to the desirability of preserving the natural beauty of the areas involved; to the quantity of compensation water to be discharged from the reservoirs; and to minimising the area of hill pastures and agricultural land to be acquired. He moved a motion embracing these three points. On the advice of the Earl of Drogheda, chairman of committees, the motion was limited to the final clause dealing with hill pastures and agricultural land. He said the select committee would fully consider all the points in the first two clauses.

Monopolies Commission

MORE questions have been asked concerning the Monopolies Commission. In the course of numerous answers, Mr P. Thorneycroft indicated that he expected to receive the report on electrical and allied machinery and plant industry this year.

Later, he made it clear that the appointment of extra members of the Commission would not shorten the time it took to prepare a report at all. To have more members looking at a matter more casually would not shorten it, Mr Thorneycroft said. He explained that when he increased membership he did so to facilitate the dealing with more subjects.

Atomic Power in Monmouth

GLAMORGAN and Monmouthshire would receive their full share of electricity generated by atomic energy since it would be fed into the national, Mr L. W. Joynson-Hicks explained. Mr D. T. Llewellyn had asked if those counties would enjoy equal opportunity with industrial users in England.

Mucomir H.E. Project

SOME details of the Mucomir hydro-electric project, the North of Scotland Board's Constructional Scheme No. 26, were given by Mr Henderson Stewart replying to questions by Mr G. Nabarro. He said the capital cost per MW to be installed was £25,000, whilst the cost of connecting the station to the existing network would be negligible as it would be within 20 yd of existing lines. He maintained that the estimated cost per MW was less than in some previous schemes. Mr Stewart said he was informed that the expected load factor based on the installed capacity of 1·5 MW was 68%. The expected saving in coal was about 5,020 tons annually (based on a conversion figure of 1·25 lb of coal per unit of electricity). Mr Nabarro pointed out that the load factor appeared highly satisfactory compared with the previous average of 27% for all completed schemes. Finally, Mr Stewart said it was hoped to start work on the scheme before the end of this year, and to complete it within two years from then.

Supply for Western Isles

COMMENCEMENT dates of the electricity supply schemes for the islands Barra, Vatersay, N. Uist, Bernera, Baleshare and Grimsay, were sought by Mr M. MacMillan. He was told by Mr Henderson Stewart that the N. of Scotland Board had nearly completed surveys of the Barra and N. Uist schemes and expected to invite tenders in the spring or summer. Subject to acceptable tender prices it was hoped to extend the Barra scheme to Vatersay and the N. Uist scheme to Bernera and Grimsay. The Baleshare project presented difficulties and was being examined further.

Mauritius Acquisition

MEMBERS were told last week about the Mauritius Government's plan to purchase the generating and distributing plant of the General Electric Supply Co., Ltd. Mr A. T. Lennox-Boyd said that after protracted negotiations with the company about the purchase of its output, and faced with the prospect of the firm ceasing to supply current after 1954, the Central Electricity Board recently offered to buy the undertaking outright. Negotiations were proceeding but nothing further could be stated at present, he said.

Research Assocs.' Surveys

IN the course of answers on Research Associations, Mr J. Bevins said a special survey of the British Scientific Instrument Research Association's work had just been started. Later he said that grants for capital expenditure to the extent of £271,000 in 1950-51 were made, in 1951-52 £53,000, in 1952-53 £17,000, and in 1953-54 £2,000. None is expected in the current year. Industries were asked to raise contributions over and above normal contributions to research associations, and estimates of total cost had to be submitted to D.S.I.R.

Staff of the A.E.A.

IN an Adjournment Debate, Mr A. Neave raised a number of staffing problems which have followed the setting up of the Atomic Energy Authority. Having mentioned the questions of housing and education, he asked about the position of the Authority's staff when atomic power stations were commissioned and possibly taken over by the B.E.A. Mr Neave wanted assurances that the staff involved could regard their future with some confidence. In his reply the Minister of Works said there was no question of redundancy arising through electric power stations being worked by the B.E.A. On the question of promotion, the Minister said that, other things being equal, preference would always be given to men working with the Authority.

Neon Sign Interference

REPLYING to Mr S. S. Awbery's complaint that neon signs on business premises caused radio interference to nearby dwellings, Mr D. Gammans said the signs accounted for only 1% of cases investigated by the Post Office. Often the trouble could be overcome by cleaning and adjusting the signs, he said, but they may require suppressors. Mr Gammans said the introduction of statutory regulations was being considered, but hitherto owners of the signs had readily agreed to remedy the matter in reported cases. Later, he said he would look into the suggestion that a neon sign be rendered innocuous as far as interference was concerned as a condition of consent for the erection of a sign.

Enfield Line Electrification

A PROPOSAL to electrify the Enfield line was included in British Railways' modernisation programme and was not now dependent on the prior construction of Route C tube, Mr J. A. Boyd-Carpenter stated last week. As regards priority, he told Mr A. H. Albu that it would be advisable to await subsequent debates.

Nickel Supplies

WAYS of overcoming the shortage of nickel had been considered by his Department, with the help of industry, the President of the Board of Trade stated in a written answer. He added that steps were being taken which should reduce the expected shortage in 1955. The Minister warned however that it was unlikely that supplies would meet demand and said it would be necessary to economise in the use of nickel for some time.

Computors at N.P.L.

THE equivalent of eight scientific staff were employed at the National Physical Laboratory on the application of electronic computors to clerical and industrial work, Mr J. Bevins stated in a written answer to Mr W. L. Wyatt who asked how many executive officials were so employed.

Automatic Train Control

THE Minister of Transport told the House last Thursday that the automatic train control equipment was steadily becoming more reliable, but in the past few months it had been necessary to redesign certain components. The trial stretch was being extended over the whole track between King's Cross and Grantham, and the equipment would be

used on the main lines when perfected. His attention was drawn to the accident free Western Region since nationalisation, to which he replied that although the system operated well there were difficulties about applying it to electrified lines. The Minister added that the proposed electrical development plan of B.T.C. indicated the intention of spending £20m on automatic train control.

Technical Education

LAST week, Mr M. MacPherson gave notice that, on going into Committee of Supply on Civil Estimates, he would draw attention to the present situation concerning technical education.

Retirement Age

NO instructions had been issued to the nationalised undertakings concerning the age at which their employees should retire, Mr L. W. Joynson-Hicks stated last week. He told Mr D. Jay that without direction the nationalised boards have said they would implement the recommendations contained in the report of the National Advisory Committee on the Employment of Older Men and Women.

Automatic Telephony

THE Assistant Postmaster-General, Mr D. Gammans, said that of 850 telephone exchanges with more than 1,000 lines, 270 were still worked manually. During later exchanges on this question it was suggested that some of the delay in making exchanges automatic was due to the effect that manufacturers of automatic exchange equipment were working to capacity on overseas contracts, which were particularly important because they were 15-25 year contracts.

Volta Scheme

IN reply to a question by Mr F. J. Erroll, the Minister of State for the Colonies, Mr H. L. Hopkinson stated that studies of various aspects of the Volta River Hydro-Electric scheme on the Gold Coast are well under way, and he hoped that the preparatory commission's report would be available early next year.

Monopolies Reports

A DIGEST of information on reports of the Monopolies Commission published to date was given in "Hansard" on Monday.

COMPANY ACTIVITIES

IS the copper situation getting out of hand? London price of the metal is constantly breaking new high records. As compared with £215 a ton when it was freed from Governmental control it has lately been around £340 per ton. Formosa is at the bottom of the trouble. On top of that there is the worst strike situation in Rhodesia so far and the decision of the American authorities to ban all exports of copper from the United States. I also believe that the recent attempts to alter the arrangements under which British users have to pay a price based on the London metal price, have fallen through.

There is romance up in Lancashire where 61-year-old Sir Vincent Ferranti, head of the firm of the same name, has made a gift of 600,000 Ordinary shares to his two sons Sebastian and Basil. These shares are not quoted on the Stock Exchange and the 6% dividend paid is nothing like what would be necessary if the shares were publicly held. Quite easily with a company of this class, shares could be worth £3 or more. So the brothers Ferranti may be worth close on £2m.

Just before Christmas I waxed enthusiastic about Westinghouse Brake and Signal Co. and suggested it was one of the finest growth stocks in the industry. Dividend has risen three years in succession and E.P.L. has still to come off. Since then the big railway electrification programme has been announced. With the company's activities stretched throughout the world the chairman at the annual meeting emphasised that a substantial capital expenditure would be needed to expand production capacity. He added that it would be necessary to continue a conservative financial policy and to plough back dividends. That does not altogether rule out the possibility of a share bonus. Past caution has built up the group's free reserves to a total of over £4,600,000 against a one class capital of £2,051,000. Since my last reference the shares have risen from 85s. to 100s. I don't suppose they will stop there.

The plastics industry is closely allied to ours. Perhaps that is why it has just had its record year. Mr D. Kleeman, chairman of O. and M. Kleeman, announced that group sales in the four months since last August were one-third higher than in the year 1953-54. Last year plastics manufacturers benefited both from general expansion in industrial activity and from increased sales of consumer goods.—*From our City Correspondent.*

R. B. Pullin and Co. Ltd.

The turnover of every company in the group was greater last year than for the previous twelve months, Mr R. B. Pullin, the chairman, reports. That satisfactory position was due in part, to the fact that certain long-term contracts were completed during the year, and work thereon which had previously been included in the item work-in-progress has been turned into either cash or debtors. The gross figure of work in progress at £393,874 was consequently £88,628 lower than a year previously, but as large additional contracts have recently been received, that item may be expected to be again expanded in the next balance sheet, he adds. One uncertainty facing the company, is the possibility that part of the Brentford site may be taken for the purposes of the projected South Wales Radial Road. Because of that some of the newer buildings have been erected under temporary licences.

Year to 30 Sept.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1950	58,174	12,219	22	15	3/9	2/4
1951	87,101	31,405	60	15	4/1	3/-
1952	115,007	34,139	65	15	3/3	2/6
1953	120,428	29,397	29	15	4/4	2/7
1954	172,043	65,542	61	15	4/1	3/4½

British Relay Wireless and Television

To finance the company's expansion programme, it is planned to raise upwards of £500,000 in a few months' time, by means of a rights issue to shareholders. Meanwhile it is proposed to increase the authorised capital from £475,000 to £750,000 by the creation of additional "A" Ordinary shares.

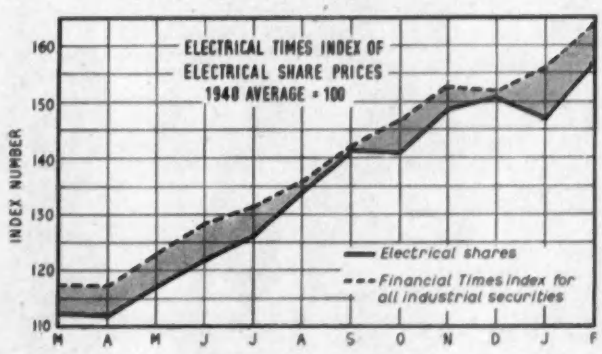
Allen West and Co. Ltd.

It is agreed to raise the authorised capital to £2,000,000 by 3m new 5s. shares, and that £585,000 be capitalised and applied in paying up in full 2,340,000 5s. Ordinary shares, to be distributed on a basis of one for every 10s. of Ordinary stock held.

Dividends Declared

Electrical Components Ltd. Interim 7½% (*same*).

Larmuth and Bulmer. Interim 7½% (*same*).



Both indices showed a considerable rise during January, particularly that for electrical shares which fully recovered from the December decline. "The Electrical Times" index for all electrical share prices rose by as much as 9·3 to 156·7. At the same time the "Financial Times" index for industrial share prices rose from 156·7 to 164·2

ELECTRIC SUPPLY NEWS

Argyll

Details of another constructional project (scheme No. 71) have been released by the North of Scotland Hydro-Electric Board. This is the Loch Glashan hydro-electric scheme, which, it is estimated, will produce 17·6m units annually. The scheme provides for utilising the waters of Loch Glashan which lies north-east of Lochgilphead among the hills behind the hamlet of Lochgair on Lochfyneside in the County of Argyll. The natural catchment area of the loch is 4 sq miles; the rainfall on a further 20½ sq miles of catchment will be utilised by means of diversion aqueducts. All the water will be collected behind a dam 1,100 ft long and 45 ft high, to be built at the outlet of Loch Glashan. From there, water will be led by a tunnel and pipeline 5,500 ft long to a 4,200 kW power station on the shores of Loch Gair. The turbo-alternator will operate under a head of 356 ft. This new scheme should help to meet the growing demand in the Kintyre and Knapdale areas for a long time, but the Board's engineers are already having to consider further reinforcement which may be in the form of an extension of the Highland Grid from the Shira scheme, near Inverary, to Kintyre.

Blackpool

The recently installed four diesel-generating sets at the B.E.A.'s Shannon Street power station, have been the subject of complaints of vibration made by local residents. The matter was raised at a recent meeting of the North-Western Electricity Consultative Council when it was pointed out that the council had nothing to do with the B.E.A. who were responsible for generation. It was agreed that the secretary should write to the North-West, Merseyside and North Wales Division.

Crawley

The Parish Council is to ask the Minister of Fuel and Power to review the position regarding the retention of overhead electricity lines in Crawley. In particular they seek the immediate placing underground of all o.h. lines in the vicinity of The Greens without charge to the Council. Capt. S. H. De La Mare, said, it was essential that the cables should be placed underground, but it was unreasonable to ask the electricity authority to carry out the work immediately. He thought the Minister would probably give them a period of four or five years to carry out the work. When the electricity authority took over the undertaking they knew there was an eventual liability to put the cables underground, and the original order was that they should be put underground within five years. Then the Minister gave permission for them to be retained overhead for an indefinite period, with the local authorities retaining the right for the matter to be reconsidered, he said.

Eire

The Electricity Supply Authority has ordered a German-built propeller type wind driven generator of 12 kW capacity. It will be erected on Verschoyle's Hill, near Crooksling Sanatorium, Co. Dublin, it is reported. A continuation of experiments which have been going on for some months past, it is expected that after tests at Crooksling that the plant will be moved to other hills for further investigations.

Lake District

Following a discussion on the question of a supply of electricity to Hartsop, at its recent meeting, the Lakes U.D.C. decided unanimously to protest "vigorously and vehemently" against the recent decision of the Planning Board, who want part of the proposed line to Hartsop to be placed underground. They decided also to request and encourage the North-Western Electricity Board to take a supply of electricity to Hartsop as soon as possible and to press for direct-representation in discussions between the two boards on the question of electricity in Lake District valleys. Moving the resolution, the Rev J. C. Rogers, Patterdale, said the Planning Board's attitude virtually prevented Hartsop from having electricity for a number of years. He thought it "slightly arrogant" that people from outside the district "meaning some of the nominated members of the Planning Board", should care more for the amenities of Hartsop than those who lived in the district. It was extraordinary that people from outside the district should have such influence that they could prevent people from getting such a necessity as electricity.

Sayings OF THE WEEK

"To bring London into the picture, the author had to introduce a purely arbitrary London weighting of 20%. Many of us can think of a Committee we should like to see the author on." Mr E. J. WITCHER in the discussion on "A Criterion of Distribution Costs" at the I.E.E.

"I wonder if these people would be willing to join in the sacrifice they have imposed upon us, and go back to paraffin lamps and no electricity." . . . REV. J. C. ROGERS, vicar of Patterdale, criticising a decision of the Lake District Planning Board requesting a power line to Hartsop to be underground.

"In 1257, it is reported by an early Engl'sh chronicler that Queen Eleanor removed from the city of Nottingham on account of fumes and the obnoxious atmosphere caused by the burning of sea coal in the city. The week before last, the city of Nottingham announced that it proposed to introduce a smokeless zone. No doubt students of the processes of Parliamentary democracy will regard the lapse of 698 years as being normal progress.". . . Mr G. Nabarro, speaking on his Clean Air Bill.

Northumberland

Northumberland County Council along with the local authorities of Blyth, Whitley Bay, Tynemouth and South Shields, are to oppose the Bill promoted in Parliament by the British Electricity Authority regarding the construction of a new power station near Blyth. The councils object to the proposed system of sluicing ash from the plant, by means of a pipeline, into the sea, near Blyth. About 500,000 tons of ash will be dealt with yearly in this way, and the councils contend that some of the ash may be swept on to their beaches, and may also interfere with inshore fishing.

North of Scotland

Under the Tummel Valley Additions Scheme (Constructional Scheme No. 31), just announced by the North of Scotland Hydro-Electric Board, the output of the existing schemes on the Rivers Tummel and Garry, in Perthshire (which have an annual output of 600 million units) will be increased by about 32·7 million units yearly. The new scheme provides for the construction of two more power stations with a total capacity of 3,900 kW, one on the shores of Loch Ericht, Perthshire, and the other on a tributary of the River Truim, near Dalwhinnie, Invernesshire. The first station, of 1,500 kW, will utilise a head of 180 ft, and the other, of 2,400 kW capacity will use a difference in level of 87 ft. Several burns will be diverted, and the 3-mile aqueduct from Dunalastair reservoir to Tummel Bridge power station will be enlarged and the water raised to increase the output of the machines in that station. The Board's Errochty power station, which is nearing completion, should come into operation early this summer.

LIGHTING SCHEMES

Banstead. The Council is recommended to spend £37,000 on a new street lighting scheme.

Felling (Co. Durham). The U.D.C. has submitted to the M.o.T. a £7,000 scheme for installing sodium lighting on 2½ miles of main road.

Holborn. The Borough Council is to spend a further £4,000 on fluorescent lighting on main roads.

Kidsgrove. U.D.C. has approved a revised scheme for electric lighting in Newchapel Ward, estimated to cost £28,473.

Tipton. Although originally opposed to the plan, Tipton T.C. was now agreed to the use of sodium lamps along its boundary with Dudley.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

14 Feb.—Darlington T.C. Improved street lighting along North Rd (A.1) —Advertised in 20 Jan. issue.

14 Feb.—Hawick T.C. Steel standards and mercury vapour lighting equipment along trunk road A.7.—See 13 Jan. issue.

14 Feb.—Huntingdon T.C. Electrical plant in pumping stations.—See 6 Jan. issue.

14 Feb.—King's Lynn T.C. Lamps and electrical sundries in year from 1 Apr.—See 27 Jan. issue.

14 Feb.—Norwich T.C. Lamps in year from 1 Apr.—See 3 Feb. issue.

14 Feb.—Poole T.C. Lamps, wiring supplies, water heaters, street lighting lanterns and concrete columns.—See 3 Feb. issue.

14 Feb.—Rainhill P.C. Sodium vapour discharge lighting units on trunk road A.57.—Advertised in 3 Feb. issue.

14 Feb.—Royton U.D.C. Lamps in year from 1 Apr.—See 3 Feb. issue.

15 Feb.—Belper U.D.C. Six sewage pumping sets.—See 30 Dec. issue.

16 Feb.—Belfast T.C. Installation at Whitla St fire station.—See 3 Feb. issue.

16 Feb.—Keynsham U.D.C. Equipment and wiring for lighting A.4 Bath Rd at Saltford.—Advertised in 27 Jan. issue.

17 Feb.—Co. Down. Electrical installation at Newry and Downpatrick clinics and offices. Consulting Engineer, J. McCandless, 6 Murray St, Belfast. Deposit £3. 3s.

18 Feb.—Abingdon T.C. Supply of and erection of concrete and steel columns, sodium lanterns, wall brackets, auxiliary equipment, involving 55 units along trunk road A.34. Borough Engineer and Surveyor, The Abbey Hse, Abingdon.

18 Feb.—Basingstoke T.C. Group A fluorescent lighting on steel columns along trunk road.—Advertised in 3 Feb. issue.

18 Feb.—Hemel Hempstead T.C. Lamps in fiscal year 1955-56.—See 3 Feb. issue.

18 Feb.—Manchester T.C. Electrical equipment for Opensham College of Further Education.—See 3 Feb. issue.

18 Feb.—Wembley T.C. Conversion of street lighting from gas to sodium vapour discharge lighting.—Advertised in 27 Jan. issue.

18 Feb.—Whickham (Dur) U.D.C. Electrical materials in year from 1 Apr.—See 27 Jan. issue.

19 Feb.—N. Ireland. Lamps for Hospital Management Committee in year from 1 Apr.—See 3 Feb. issue.

19 Feb.—Prudhoe U.D.C. Electrical installation in 28 houses at Castle Dene. Engineer, Council Offices, 18 South Rd.

19 Feb.—Stanley U.D.C. Group A 400 W mercury vapour lamps, lanterns and control gear, and concrete columns, for Bradford Rd, A650.—See 20 Jan. issue.

19 Feb.—Worsley U.D.C. Supply of electric lamps in year from 1 Apr. L. T. Broome, Engineer and Surveyor, Town Hall, Walkden, Manchester.

21 Feb.—Newark-on-Trent T.C. MV lamps on steel columns and filament lamps on concrete columns.—Advertised in 3 Feb. issue.

21 Feb.—Tynemouth T.C. Lamps and cable, columns, lanterns and fittings, and household accessories in year from 1 Apr.—See 27 Jan. issue.

22 Feb.—N. Ireland. Electrical maintenance work for E. Antrim Hospital Committe in year from 1 Apr. Secretary, Moyle Hospital, Larne.

22 Feb.—Preston T.C. Installation at Ribbleton Hall school.—See 13 Jan. issue.

22 Feb.—Wellington (Som) U.D.C. Supply and erection of group A street lighting installation comprising 60 140 W sodium lamps on concrete columns along about 1¼ miles of A.38. H. V. Cuerden, Engineer and Surveyor, 35 Fore St. Deposit £2. 2s.

23 Feb.—East Riding. Supply of electric lamps in year from 1 Apr. Supplies Officer, County Hall, Beverley.

23 Feb.—Luton T.C. Installation at Beach Hill, Tennyson Rd and Maidenhall School canteens.—See 3 Feb. issue.

24 Feb.—Brigg U.D.C. Class A street lighting units on concrete columns and wall brackets.—Advertised in 3 Feb. issue.

24 Feb.—Co. Down. Electrical installation at new primary school at Scarva. T. Scott, 30 College Gdns, Belfast. Deposit £3. 3s.

24 Feb.—Charlton Kings U.D.C. Supply, erection, wiring of 19 concrete columns and brackets with lanterns and accessories for class A sodium discharge street lighting along London-Fishguard Rd (A.40). Surveyor, Council Offices, Copt Elm Rd, Charlton Kings, Cheltenham.

25 Feb.—Belfast T.C. Substation distribution board.—Advertised in 3 Feb. issue.

25 Feb.—Belfast T.C. Supply of (*a*) rubber insulated cables and flexible cords (Form No. 29); and (*b*) blow-down pipework (Form No. W.68). Separate contracts. Electricity Dept., East Bridge St. Deposit for (*a*) 10s.—Advertised in this issue.

25 Feb.—Kidsgrove U.D.C. Supply and erection of 289 15 ft concrete columns with 80 W mercury vapour discharge lamps, lanterns and accessories, and 9 brackets with auxiliaries. Engineer and Surveyor, Town Hall. Deposit £1. 1s.

25 Feb.—Portslade-by-Sea U.D.C. Lighting installation included in road works along Fairfield Gdns. Engineer and Surveyor, Council Offices, 17 Station Rd, Deposit £3. 3s.

26 Feb.—Dagenham T.C. Group A street lighting units in Ballards Rd.—See 3 Feb. issue.

26 Feb.—Irlam U.D.C. Lamps in year from 1 Apr.—See 3 Feb. issue.

26 Feb.—Stockport T.C. Laboratory equipment for Stockport College.—See 20 Jan. issue.

28 Feb.—Blackpool T.C. Supply of group A and B street lighting equipment including concrete columns and brackets, lanterns, time switches, chokes and capacitors. Illuminations and Public Street Lighting Officer, Electrical Services Dept., Rigby Rd East. —Advertised in this issue.

28 Feb.—Dewsbury T.C. Street lighting equipment.—Advertised in 27 Jan. issue.

28 Feb.—Friern Barnet U.D.C. Supply of metal filament and mercury vapour lamps and sodium vapour lamps and jackets. Engineer and Surveyor, Town Hall, N.11.—Advertised in this issue.

28 Feb.—Harrogate T.C. Lamps in year from 1 Apr.—See 3 Feb. issue.

28 Feb.—Co. Kildare. Rewiring of hospital at Naas.—See 27 Jan. issue.

28 Feb.—Manchester T.C. Electrical installation in 108 flats and maisonnettes at Beswick. Director of Housing, Town Hall.—Advertised in this issue.

28 Feb.—Southampton T.C. Electrical installation in Ludlow Rd infants' school. Documents from Borough Architect, Civic Centre, before 14 Feb. Deposit £5. —Advertised in this issue.

28 Feb.—Westhoughton U.D.C. Lamps in year from 1 Apr.—See 3 Feb. issue.

1 Mar.—Widnes T.C. Electrical materials in year from 1 Apr. J. Holt, Borough Engineer and Surveyor, Town Hall.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 130 queries answered this week

Wall mounted handryers, makers of? P.J.C.—Bylock Electric Ltd., 109 South St. Ponders End, Middx.; Scottish Heat and Vacuum Ltd., Arbroath, Angus, Scotland; M. and J. Lossos and Co., Ltd., 31 Beethoven St, W.10.

"Admel" drawing board lighting, makers of? S.E.—Associated Drawing Materials and Equipment Ltd., 28 Victoria St, S.W.1.

"Daleware" holloware, suppliers of? E.B.—Easipower Ltd., 213/215 Gloucester Place, N.W.1.

"Newall" adjustable girder clips, makers of? F.B.—Evans and Newall Ltd., Moor Top Works, Heaton Moor, Stockport.

Carbon impregnated sheet-type heating elements, makers of? A.B.—Mc and B. Heat Control Ltd., Heaton Works, Potters St, near Harlow, Essex.

"Challenger" irons, makers of? E.E.—Revo Electric Co., Ltd., Tividale, Tipton, Staffs.

"G.N." immersion heaters, makers of? T.E.—Geo. Nobbs (1935) Ltd., 87/89 Cleveland St, W.1.

ANSWERS WANTED

"Teleglow" floral lamps, makers of? M.E.B.

"Highlight" plastic torches, makers of? P.I.

2 Mar.—Fifeshire. Erection of steel columns and supply and erection of steel brackets, sodium lanterns and ancillary gear for group A street lighting in Kincardine. County Surveyor, Belfield, Milligate, Cupar.

2 Mar.—N. Ireland. Installation for geriatric unit at Belfast City Hospital.—See 3 Feb. issue.

3 Mar.—Dublin. Supply, installation, etc., of electro hydraulic dockside capstans for Port and Docks Board. Consulting Engineer, N. O'Dwyer, 6 Burlington Rd. Deposit £10.

3 Mar.—Lancaster. Supply of electric lamps in year from 1 Apr. for Lancaster Moor Hospital. Documents from Supplies Officer at the Hospital.

4 Mar.—Blackburn. Supply of electric lamps in year from 1 Apr. C. R. Ikin, secretary, Calderstones Hospital Management Committee, Whalley, nr. Blackburn.

4 Mar.—Chatteris (Isle of Ely) U.D.C. Concrete and steel lighting columns, conversion from gas to electricity, and equipment for mercury vapour and tungsten lighting.—See 3 Feb. issue.

5 Mar.—Co. Mayo. Sewage pumping plant in Kiltimagh sewerage scheme.—See 20 Jan. issue.

7 Mar.—Buxton T.C. Supply and erection of 47 group 400 W mercury units on steel columns along trunk road A.6. Borough Engineer, Town Hall. Deposit £2. 2s.—Advertised in this issue.

7 Mar.—Stepney B.C. Installation in blocks of flats in Sidney St.—Advertised in 3 Feb. issue.

8 Mar.—Swanage U.D.C. Supply and erection of 47 open-type 140 W sodium lamps on 25 ft concrete columns, and 84 open-type 60 W sodium lamps on 15 ft concrete columns. P. S. Browne, Surveyor and Water Engineer, Town Hall.

9 Mar.—Sunderland R.D.C. 12 months' supply of goods, housing maintenance programme.—See 27 Jan. issue.

12 Mar.—Airdrie T.C. Lamps in year from 16 May.—See 3 Feb. issue.

31 Mar.—Belfast T.C. Central evaporating plant.—Advertised in 27 Jan. issue.

6 Apr.—Wandsworth B.C. Supply and erection of concrete columns and ancillary gear for groups A and B street lighting. Borough Engineer, Municipal Buildings, S.W.18.—Advertised in this issue.

7 Apr.—Belfast T.C. Supply, erection at Power Station West of 3,300 V and 400 V switchgear and accessories (Tender No. N.1630). Also (closing date **24 Mar.**) extensions of existing coal handling plant, comprising 150, 300 and 600 tons per hr belt coal conveyors. Merz and McLellan, consulting engineers, Carliol Hse, Newcastle-on-Tyne. Deposit £5. 5s. in each case.—Advertised in this issue.

No date stated.—N. of Scotland H.E. Board. 660 V power and auxiliary cables between Clunie sub-station and power station.—Advertised in 3 Feb. issue.

No date stated.—N. of Scotland H.E. Board. Supply and erection of 33 kV switchgear for Kintore substation. Merz and McLellan, 72a George St, Edinburgh. Deposit £2. 2s.—Advertised in this issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

3 Mar.—U.S.A. Supply of a 10,000 kVA, 110,000 grounded wye- to 345,000 wye-volt, 3-phase, class OA, 60 c/s outdoor power transformer. U.S. Bureau of Reclamation, Building 53, Denver Federal Center, Denver 2. Tender No. DS-4334.

7 Mar.—India. Supply of two 3,000 kW turbo-alternator sets complete with all equipment. (F.O.A. Procurement). Tender R.3. Documents from Govt. of Uttar Pradesh, Executive Engineer, Rihand Project Div., Electricity Dept., 6 Edmonston Rd, Allahabad, at Rs.25. B.o.T. (Ref.: ESB 1741/55).*

9 Mar.—South Africa. Supply of one 75 MVA, 200A, 6·6 kV, 3 unit switchboard. Tender No. C.8826. Stores Dept. of S. African Railways, Johannesburg. B.o.T. (Ref.: ESB 1943/55).*

15 Mar.—India. Supply of fuse cut-outs, automatic reclosers, shunt capacitors, oil circuit-breakers, and hand operated isolating switches. F.O.A. Procurement invitation No. SE–2/2901E–2129E–2145E/111. Documents available from Director General, India Stores Dept., Govt. Building, Bromyard Ave, London, W.3, at Rs.10.

26 Mar.—Egypt. Factories Directorate of Min. of War in Cairo, require lighting fittings for workshops, offices, roads, etc., machine lamps, hand and desk lamps, lamp holders, switches, plugs and sockets. B.o.T. (Ref.: ESB 1824/55).*

4 Apr.—India. Govt. of Madras Electricity Dept. require lattice steel towers, ACSR conductors and standard galvanised steel ground cable for erection of Neyveli-Villupuram 110 kV transmission line. Specification No. E.253. Dept. is at 157 Mount Rd, Madras. B.o.T. (Ref.: ESB 1517/55).*

4 Apr.—Kuwait. Supply and erection of indoor HkV metalclad switchgear having ratings of 350 MVA and 500 MVA for substations. Dept. of Electricity, Govt. of Kuwait.—Advertised in this issue.

7 Apr.—Egypt. Supply and erection of complete self-contained power station at El Tabbin to be connected to Cairo 63kV grid now being installed. Tenders invited by Egypt's Ministry of Public Works. B.o.T. (Ref.: ESB 1405/55).*

9 May—India. Supply, erection of five 3-ton electric portal cranes, for Commissioners for Port of Calcutta. Documents from Rendel, Palmer and Tritton, 125 Victoria St, London, S.W.1, at £3 per set.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 8 February

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	350	+29	229
,, (3 months)	332	+30	214
LEAD, refined pig, min. 99·97% purity (cash)	104½	−½	82½
,, (3 months)	105	−½	81½
TIN, refined, min. 99·75% purity (settlement)	716	+2	660
,, (3 months)	720	+5	636
ALUMINIUM, ingots 99·99·5%	163	—	156
ZINC, virgin, min. 98% purity (cash)	91	+¼	74½
,, (3 months)	88½	−¼	72½
RUBBER No. 1, RSS, spot (per lb.)	30½d.	+1/16d.	16 1/16d.
,, c.i.f. basis, ports, Apr. (per lb.)	29⅛d.	—	16 5/16d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52½	—	51½
Mild Steel Tape (0·104 in.)	41½	+½	40

Contracts Placed

Banstead (Sur) T.C. Provision of street lighting for housing sites. Harland and Wolff Ltd., £2,273.

Leek (Staffs). Rewiring at St Edward's Hospital, Cheddleton. E. Holloway Ltd., £2,463.

Stoke-on-Trent. Installation and rewiring at Shelton Hospital. T. Wood and Son (Chester) Ltd., £2,174.

TRADE NOTES

Branch Offices. Aluminium Union Ltd. have opened branch sales offices at Gazette Buildings, Corporation St, Birmingham (Telephone No: Central 1446), and at National House, 36 St. Ann St, Manchester (Telephone No: Blackfriars 9772-3). The Birmingham office is in charge of Mr W. J. Cadd, and the Manchester office in charge of Mr A. W. K. Lees.

B.W.I. Agency. Brookhirst Switchgear Ltd., have appointed the British Engineering Manufacturers' Alliance (1952) Ltd., P.O. Box 16, Port-of-Spain, Trinidad, British West Indies, as their accredited agents in Trinidad and British Guiana.

Changes of Address. The Luton branch of John E. Dallas and Son Ltd., have moved to more spacious premises at 15 Stanley St, Luton. Telephone Luton 2275.

The Newcastle office of the John Thompson group has moved to permanent accommodation at "A" Floor, Milburn Hse, Newcastle-upon-Tyne, 1. Telephone Newcastle 29720.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Loma. 734,424. Class 9. Scientific instruments, etc. Loma Electronic Equipment Ltd., 27/29 Union St, S.E.1.

Analmatic. 736,085. Class 9. Electrical apparatus and instruments, etc. Baird and Tatlock (London) Ltd., 14/17 St. Cross St, E.C.1.

Fleurlite. 735,805. Class 11. Lighting installations, etc. Siemens Electric Lamps and Supplies Ltd., Caxton House, Tothill St, S.W.1.

Ever Ready. 713,782. Class 28. Battery operated toys, Ever Ready Co., (Gt Britain) Ltd., Hercules Place, N.7.

Metameter. 729,165. **Metavane.** 729,166. Class 9. Apparatus and instruments for use in controlling indicating, measuring, etc. Bristol's Instrument Co., Ltd., Lynch Lane, Weymouth, Dorset.

Pyreco. 733,316. Class 9. Measuring instruments. Pyrometric Equipment Co., 49 High St, Market Harborough, Leics.

Bylock Electravac. 734,289. Class 9. Suction cleaners, etc. Bylock Electric Ltd., 109 South St, Enfield, Middx.

Repitrol. 735,698. Class 9. Electric and electronic repeating apparatus, etc. Repitrol, 45 Church Cres, Finchley, N.3.

BUSINESS PROSPECTS

Acton. Plans submitted by Henry White and Son Ltd., 133 Regent St, London, W.1, for factory on Great Western trading estate. Two storeys to be added to Waring and Gillow Ltd.'s premises in Western Ave. Same also to premises of J. Wainer and Co. Ltd., Vale Grove.

Barking T.C. Construction of two 9-storey blocks each containing 48 flats on Thames View estate. Borough Architect, Town Hall.

Bedale R.D.C. Construction of 41 houses. Architects are Richardson and Shaw, 3 Skinnergate, Darlington.

Billingham U.D.C. Construction of 40 houses. Engineer and Surveyor, Council Offices, Haverton Hill.

Birmingham. Dowding and Mills Ltd. considering factory extensions and rebuilding of office block at Camp Hill.

Also the Theatre Royal to be demolished and replaced by new store and blocks of offices. Work expected to begin in about 2 years time. Estimated cost £2 millions. Architects are Cotton, Ballard and Blow, Cavendish Hse, Waterlow St.

Bolton T.C. Erection of 22 houses and flats on Adrian Rd estate, and 162 dwellings in phase 1 of Breightmet Neighbourhood Unit. Housing Director, Town Hall.

Burnley. Eric Coupe Ltd., of Haplon, negotiating for site for factory in Rossendale Rd area.

Cardiff. Land on Newport Rd industrial estate may soon be leased to Atlas Diesel Ltd. for branch premises. Home for aged to be built at estimated cost of £57,000.

Carlow (Eire) U.D.C. Erection of 193 houses and 6 flats. J. O'Shea, Town Hall.

Castle Donington (Leic) R.D.C. It is proposed to erect 72 houses on Park Lane site and 22 dwellings on 5 other sites.

Co. Antrim. Gallaher Ltd., Virginia Hse, York St, Belfast, are planning erection of factory at Ballymena.

Cockermouth (Cumb) R.D.C. Recommended to approve erection of 30 houses at Broughton Moor.

Co. Louth. Construction of 28 dwellings at Kiloaran. C. O'Cleireachain, County Offices, Dundalk.

Colwyn Bay T.C. It is proposed to erect 44 flats on Elroy Rd estate, Rhos-on-Sea, and ten houses on same estate.

Croydon. Factory and offices in Vulcan Way, Addington, proposed by A. Barton and Co. (Toys) Ltd., 55 East Hill, S.W.18.

Darlington T.C. Permission sought to include second stage of Technical College and College for further Education in 1956-57 building programme.

Derby. Site to be leased to Platers and Stampers Ltd., City Rd, for erection of a factory.

East Kilbride. Waterlow and Sons Ltd., London, E.C.2, are to erect large factory. Scheme expected to cost about £1 million.

Greenock. Confectionery factory being planned by R. Walker, 6 South St.

Hainault (Essex). Factory being planned for Advance Components Ltd., Back Rd, E.17. Fuller, Hall and Foulsham, 212 High Holborn, W.C.1, are architects.

Hull T.C. During 1955-56 council to erect 1,193 houses and 16 shops.

Inverness. Highland Sweets (Inverness) Ltd. to erect factory in new development area.

Kingsbury. New factory to be built in Honeypot Lane by Kestral Engineering Co. Ltd., of Scrubs Lane, N.W.10.

Leicester. Metalastik Ltd. propose new building for technical, administrative and research staff in Evington Valley Rd. John Bull Rubber Co. Ltd., in same road, are planning block of offices.

Liverpool T.C. Erection of 20 dwellings in Watmough St; 12 flats in Penrhyn St; and conversion of building into shop in Upper Mann St. City Architect, Blackburn Chambers, Dale St, Kingsway.

London. Printing factory being planned by Matthews and Son, architects, 91 Gower St, W.C.1, in Lamble St.

Mansfield. Plans of Norvic Shoe Co. Ltd., Norwich, have been approved for erection of factory. Also, further floor to be added to factory of Foister, Clay and Ward Ltd., Redcliffe Rd.

Melton and Belvoir (Leic) R.D.C. It is proposed to erect 30 houses at Asfordby, and ten each at Croxton Kerrial and Long Clawson.

Middlesbrough T.C. Erection of Ladgate and Park End county primary schools. Director of Education, Woodlands Rd.

Otley U.D.C. Erection of 38 houses on Weston Lane estate. Engineer and Surveyor, Council Offices, North Parade.

Perivale (Middx). Sanderson Fabrics propose to build factory. Architects are Ley, Colbeck and Partners, Palmerston Hse, Bishopsgate, E.C.2.

Portsmouth. S. Schneiders and Son Ltd. propose factory in Lake Rd, and architects are A. W. Pipe and Sons, 8 Queen St, London, E.C.4.

Rugby T.C. Erection of three-storey block comprising 6 shops and 6 maisonnettes off Buchanan Rd. Borough Surveyor, Town Hall.

Salford T.C. Erection of 48 flats and 3 houses at Moss Meadow. City Engineer, Town Hall.

Sheringham (Norf). Plans in hand for secondary modern school estimated to cost £124,900.

Sunbury-on-Thames. New laboratories proposed by Anglo-Iranian Oil Co., Ltd. Architects are J. H. Wilson, H. C. Mason and Partners, 3 Chandos St, London, W.1.

Sunderland T.C. Aged persons' hostel on Hylton Red House estate being considered. Cost estimated at £40,000.

Surbiton (Sur). Wayne Kerr Engineering Co., Ltd., to build new factory at cost of about £50,000. Architects, L. Manasseh and Partners, 29 Buckingham St, London, W.C.2.

Tottenham B.C. Erection of 301 dwellings on Potters Bar site. Borough Engineer, Town Hall, N.15.

Tynemouth T.C. Blocks of flats planned as part of redevelopment of East End of North Shields. Architects are Tasker and Child, Trinity Buildings, New Bridge St, Newcastle.

Wallasey T.C. Construction of Moreton secondary modern school. Borough Architect, Town Hall.

Wellingborough U.D.C. It is proposed to build 235 council and 124 private houses on Northampton Rd estate.

West Hartlepool T.C. Scheme recommended for construction of assembly hall and cafe at Seaton Carew to cost about £56,000.

Workington. Plans in hand for proposed maternity wing at Workington Infirmary for Newcastle Hospital Board. Estimated cost, £76,000.

Gazette Announcements

COMPANIES ACTS

A. W. Lines Ltd. Last day for receiving proofs in respect of intended dividends, 21 Feb. Liquidator is A. W. Hunter, Walter Hse, 418-22 Strand, London, W.C.2.

Whittaker Electrical Products Ltd. Meetings of members and creditors will be held at 57 Blandford St, W.1, on 14 Mar. at 11 a.m. and 11.30 a.m. respectively to receive liquidator's report.

Winding-Up

D. R. Weir (Ewell) Ltd. At first meeting of creditors Official Receiver reported company was formed in Feb., 1952, with a nominal and issued capital of £5,000. Mr D. W. Weir had stated he commenced business as a dealer in radio, television and electrical goods from premises in Ewell which he held on lease. Company was incorporated to take over that business. No statement of affairs had been filed but according to Official Receiver's present information liabilities amounted to £9,226, of which £193 was due to preferential creditors; £1,757 trade and expense accounts; £5,073 loans and interest; and £2,203 bank overdraft. Assets were said to comprise: stock £1,500; fixtures and fittings £350; plant and equipment £600; motor van £200; and book debts £500. Failure was attributed to shortage of working capital; inadequate turnover; and loss in connection with a business at 215 Fir Tree Road, Epsom, from which address the company also traded. Resolution passed for appointment of Mr N. W. Osborne, C.A., 11/12 Finsbury Sq, E.C.2, as liquidator.

Bankruptcy

Ian Walker, electrical retailers. Business carried on at Swiss Cottage, Hampstead, N.W.6, by Ian M. Walker and Douglas B. Beavan in partnership. Debtor I. M. Walker made a separate application for discharge at London Bankruptcy Court recently. Receiving Order was made against him in March, 1934. Official Receiver reported that proofs of debt admitted against partnership amounted to £1,015, but a number of creditors had not claimed. Partnership assets, which had been estimated at £213, had realised £159, and after payment of fees, costs, etc., dividend of 1s. 7d. in the £ had been paid. Partnership had been carried on with knowledge of insolvency, the Registrar said, but taking all circumstances into account applicant could have his discharge subject to suspension of six months.

BANKRUPTCY ACTS

Release of Trustee

Hastings. James H. Thompson and Henry A. Why trading as Southern Radio TV Electrical Services at 52 Wellington Mews, Hastings. Trustee was E. C. Sherwood, Official Receiver, 8 Old Steine, Brighton.

Intended Dividends

Wandsworth. Harry Turner, electrical contractor of 20 Battersea Rise, Clapham Common. Last day for receiving proofs, 18 Feb. Trustee is C. T. Newman, Official Receiver, 58-61 York Terrace, Regent's Park, N.W.1.

MEETINGS TO NOTE

THURSDAY, 10 FEB.

I.E.E. (London). "Maintenance Principles for Automatic Telephone Exchange Plant," R. W. Palmer. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. of Scotland). "Possibilities of Cross-Channel Power Link between British and French Supply Systems," F. J. Lane, M. E. Laborde and D. P. Sayers. Queen's College, Dundee, 7 p.m.

I.E.E. (Western). Faraday lecture: "Courier to Carrier in Communications," T. B. D. Terroni. Colston Hall, Bristol, 6.45 p.m.

I.E.E. (Swansea sub-centre). "Service Experience of Effect of Corrosion on Steel-Cored-Aluminium Overhead Lines," J. S. Forrest and J. M. Ward. Elect. Showrooms, Kingsway, 6 p.m.

I.E.S. (Manchester). Contractors' Night. Elect. Offices, Town Hall, 6 p.m.

DERBY ELECTRICAL SOC. "Fine Measurements," J. R. Adams. Elect. Showrooms, Irongate, 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish). "Radio Telephone Systems to the Islands," T. Moxon. 39 Elmbank Cresc., Glasgow, 7 p.m.

FRIDAY, 11 FEB.

I.E.E. (N. Staffs). Annual dinner at Crown Hotel, Stone.

I.E.E. (London Students). Conversazione and dance at Savoy Place, W.C.2, 6.30 p.m.

MONDAY, 14 FEB.

I.E.E. (London Education). Discussion on "Teaching Faraday's Law of Electromagnetic Induction," P. Hammond. Savoy Place, W.C.2, 6 p.m.

I.E.E. (N. Eastern). "Possibilities of Cross-Channel Power Link between British and French Supply Systems," D. P. Sayers, M. E. Laborde and F. J. Lane. Neville Hall, Newcastle, 6.15 p.m.

I.E.E. (S. Midland Supply and Utilisation). "Aluminium-Sheathed Cables," P. M. Hollingsworth and P. A. Raine. Imperial Hotel, Birmingham, 6 p.m.

I.E.E. (N. Staffs). "Transatlantic Telephone Cable," M. J. Kelly, Sir W. Gordon Radley, G. W. Gilman and R. J. Halsey. Duncan Hall, Stone, 7 p.m.

I.E.E. (Rugby Students). Film evening at Laurels Club, Dunchurch Rd, 7.30 p.m.

I.E.E. (Western Supply) "Electrical Revolution," L. G. Brazier. S. Wales Inst. of Engineers, Park Place, Cardiff, 6 p.m.

I.E.S. (Sheffield). "Some Aspects of Industrial Lighting from Factory Inspector's Viewpoint," D. E. Jones. The University, Western Bank, 6.30 p.m.

LEICESTER ELECTRICAL SOC. "Electrical Equipment in Ships," R. E. Crick. Elect. Offices, Charles St, 7 p.m.

HARDWARE TRADES FAIR. First exhibition opens today at Royal Horticultural Hall, Westminster, continuing until 18th.

ELECT. TRADES COMMERCIAL TRAVELLERS' ASSOC. Informal meeting at Grand Hotel, Manchester, 5.45 p.m.

JUNIOR INSTN. OF ENGINEERS (Sheffield). "Blast Furnace Plant and Operational Problems," E. A. Cotterill; "Electrical Equipment and Services for Blast Furnace Plant at Park Gate Iron and Steel Works," H. Demaine. Livesey Clegg Hse, 7.30 p.m.

TUESDAY, 15 FEB.

I.E.E. (London Measurements). "Service Engineer at an Atomic Energy Establishment," W. E. Harris. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Cambridge Radio). "Colour Television," L. C. Jesty. Cavendish Laboratory, 8.15 p.m.

I.E.E. (N. Midland). "J. Notation" and "Graphical Methods," R. A. H. Sutcliffe and T. R. Lupton. Technical College, Batley, 6.30 p.m.

I.E.E. (N.W. Utilisation). "Brushless Variable-Speed Induction Motor," Prof F. C. Williams and E. R. Laithwaite. Elect. Engineering Labs., the University, Manchester, 6.15 p.m.

I.E.E. (S.E. Scotland). "High-Voltage Cables," J. S. Hastie. Carlton Hotel, North Bridge, Edinburgh, 7 p.m.

I.E.E. (N. of Scotland). "Natural Sources of Energy," J. E. Whittaker. Burnetts Tearooms, 42 Academy St, Inverness, 7.30 p.m.

I.E.E. (Rugby). "Electrification of Manchester-Sheffield-Wath Lines of B.R." J. A. Broughall, and K. J. Cook. College of Technology and Arts, 6.30 p.m.

I.E.E. (Swansea sub-centre). Short papers. Elect. Showrooms, Kingsway, 6 p.m.

I.E.S. (Liverpool). "Design and Application of Flameproof Lighting Equipment," D. A. Strachan. Liverpool Engrng. Soc., 24 Dale St, 6.30 p.m.

I.E.E. (London Students). Film evening at Chelmsford Public Library.

MIN. OF WORKS LECTURE (Newport, I.o.W.). "Thermal Insulation of Buildings," R. R. Houston. I.o.W. Tech. College, Hunnyhill, 7 p.m.

A.S.E.E. (London). "Cathodic Protection," Dr W. F. Higgins. 2 Savoy Hill, W.C.2, 6.30 p.m.

INSTN. OF MECHANICAL ENGRS. Report on "Investigation into Failure of Two 100 MW Turbo-generators." Sir Claude Gibb, 1 Birdcage Walk, S.W.1, 5.30 p.m.

WEDNESDAY, 16 FEB.

I.E.E. (Sheffield). "Recent Ideas and Experiments in Magnetism," Prof L. F. Bate. Grand Hotel, 6.30 p.m.

I.E.E. (N.W. Radio). "An 8 MeV Linear Accelerator for X-rav Therapy," C. W. Miller. Engrs.' Club, Albert Sq, Manchester, 6.45 p.m.

I.E.S. (N. Lancs). "Lighting for Sport," A. Wilcock. Elect. Offices, 19 Friargate, Preston, 7.15 p.m.

I.E.S. (Tees-side). "Design and Application of Flameproof Lighting Equipment," D. A. Strachan. Cleveland Scientific Inst., Corporation Rd, Middlesbrough, 6.30 p.m.

A.S.E.E. (Manchester). "Relays and Automatic Control in Industry," Dr W. L. Stern. Engrs.' Club, Albert Sq, 7.30 p.m.

A.S.E.E. (Nottingham). "Development and Application of Time-Switches," E. M. Selley. Elect. Offices, Smithy Row, 7.30 p.m.

A.S.E.E. (Southampton). Technical films at Polygon Hotel, 8.15 p.m.

A.S.E.E. (S.W. London). "I.E.E. Regulations," J. J. Looker. Guild Hse, 32 Worple Rd, Wimbledon, 8.15 p.m.

THURSDAY, 17 FEB.

I.E.E. (London Utilisation). "Introduction to Study of Servo-Mechanisms," P. J. Bhatt; "Development of 50 c/s Traction in France," E. J. Davies; "Electricity Applied to Oil Production," G. Gascoigne. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Southern). "Owen Falls Hydro-Electric Scheme," T. A. L. Paton and R. G. T. Lane. Portsmouth College of Technology, 6.30 p.m.

I.E.E. (S. Western sub-centre). "Submerged Telephone Repeaters for Shallow Water," R. J. Halsey and F. C. Wright. Electric Hall, Torquay, 3 p.m.

I.E.E. (Irish). "New Design of Control Installations for Transmission Stations," G. M. Mulhern and D. W. O'Neill. Trinity College, Dublin, 6 p.m.

CHELMSFORD ENGRNG. SOC. "Glass from the Engineers' Viewpoint," P. M. Davidson. Crompton's Social Hall, 7.30 p.m.

A.S.E.E. (Watford). "Electricity in Brewing Industry." Clarendon Hotel, Station Rd, 8 p.m.

FRIDAY, 18 FEB.

I.E.E. (N. Ireland) Annual dinner-dance at Grand Central Hotel, Belfast, 7.15 p.m.

E.P.E.A. (S. Meter Engrs. Group). "Repair of Electricity Meters," W. Jones and F. A. Miles. Caxton Hall, Westminster, 6.30 p.m.

ELECT. TRADES COMMERCIAL TRAVELLERS' ASSOC. Annual Luncheon at Connaught Rooms, W.C.2, 12.15 p.m.

SATURDAY, 19 FEB.

A.S.E.E. (Oxford). "Fluorescent Lighting Maintenance, Colour Changing and Dimming," H. Hewitt. Y.M.C.A., 10 George St, 6.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Hansella Products Ltd. General, mechanical and electrical engineers, etc. Nom. cap.: £3,500. Dirs.: to be appointed by subs. Subs.: F. L. Gunstone, 30 Woodside Rd, Amersham; and Margaret A. Needs, 1 Queen's Ct, Queen's Rd, Richmond, Surrey.

Printing and Paper Drives Ltd. To enter into agreement with James M. Simms, to carry on business of engineers and contractors for sale, manufacture, letting on hire, erection and maintenance of goods and apparatus connected with production of light, heat, sound and power by electricity, etc. Nom. cap.: £20,000. Dirs.: not named. Subs.: P. P. Ramsay, Hillingdon, Clamp Hill, Stanmore, Mddx., and F. G. Crutchfield, White Cottage, Kirby Rd, Walton-on-Naze, Essex.

G. and A. Harrison Ltd. 197 Twickenham Rd, Isleworth, Mddx. Manufacturers of and dealers in hardware, ironmongery, builders' suppliers, electrical goods, etc. Nom. cap.: £5,000. Dirs.: G. Harrison and Mrs A. M. K. Harrison.

C. D. Stone (Dunstable) Ltd. High St South, Dunstable. Heating, ventilating and general engineers, etc. Nom. cap.: £20,000. Dirs.: C. D. Stone and Evelyn M. Stone, D. E. Jenkins and D. E. Harris.

Radio and Electrical Services (Somerset) Ltd. Linden Hse, High St, Paulton, Somerset. To take over business of radio, television and electrical engineers carried on at Midsomer Norton, and Paulton, Som., by Norton Hill Radio Electrical and Television Service. Nom. cap.: £5,000. Dirs.: M. H. Champion and G. F. Roberts.

Gate Electronics Ltd. 10 Coleman St, E.C.2. Nom. cap.: £1,000. Dirs.: L. A. Smullan, M. W. Kaye, R. Smullan, and Mrs G. Kaye.

Kelly Acoustics Ltd. Manufacturers of and dealers in scientific, electric, electronic and acoustical and sound producing machines, etc. Nom. cap.: £5,000. Dirs.: W. Fell and Stanley Kelly, addresses not stated. Subs.: G. W. Russell and Margaret Corker, 108a Cannon St, E.C.4.

Projectron Ltd. Lyon Rd, Hersham Trading Estate, Hersham, Walton-on-Thames. Manufacturers of photographic, optical, electronic and scientific apparatus, etc. Nom. cap.: £4,000. Dirs.: F. Boram and Christine R. Boram.

Charles Bernard and Co., Ltd. 721 North Circular Rd, N.W.2. Manufacturers of and dealers in engineering products, electrical, steel, metal, wood and plastic products, fancy goods, etc. Nom. cap.: £100. Dirs.: B. L. Donati and C. H. Cosmelli.

S. and M. Lee, Ltd. Mile End Rd, E.1. Electrical and radio dealers and manufacturers, sellers and hirers of radio, electric or mechanical articles, etc. Nom. cap.: £3,500. Dirs.: S. Lee and P. Lane.

Co. incorp. outside G.B. having established place of business within G.B.

Electrovert Ltd. British address: 29 Sandringham Rd, Brent, N.W.11. Registered in Canada in October, 1951, as electrical and electronics company, etc. Capital stock: 500 shares without par value. Name of person authorised to accept service: G. Erdelyi.

Overhead Service Accessories

60 AMP

Two additional Service Fuses for outdoor use are now available, one for maximum continuous working current up to 60 amp and the other up to 200 amp, both being suitable for Cartridge Fuse-links. The design is based on that of the well-known HENLEY 100 amp Outdoor Service Fuses but arranged to accommodate Cartridge Fuse-links.

HENLEY Outdoor Service Fuses

200 AMP

CARTRIDGE TYPE

Suitable for mounting on walls, on poles or with shackle type insulators.

Please ask for Folder 47/A.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD. 51-53 HATTON GARDEN, LONDON, E.C.1

THERE'S not a choke anywhere. Nor a starter. Nor a P.F. capacitor. All there is, in fact, is a fluorescent lamp in series with a tungsten lamp. For this is Philips "Gear-less" Fluorescent Lighting . . . and what a magnificent light it is!

Philips "Gear-less" Lighting is three times lighter in weight than standard fluorescent lighting — yet costs only half as much. So it gives you a new market — a new market for inexpensive fluorescent in shops, offices, display work, for all sorts of commercial and industrial uses. Your first step? Get in touch with Philips right away!

So many sales features!

Lowest priced fluorescent lighting. Fluorescent lamp and filament lamp can be fixed separately or together, as desired · Absolutely noiseless in operation · Very light weight · No control gear or starter switch required · With Deluxe Warm White lamp gives perfect colour rendering for the display of food · Light equal to two 100 watt filament lamps for only 115 watts.

"GEAR-LESS" FLUORESCENT LIGHTING

from PHILIPS

PHILIPS ELECTRICAL LIMITED

Lighting Division, Century House, Shaftesbury Avenue, London, W.C.2

TUNGSTEN, FLUORESCENT, BLENDED AND DISCHARGE LAMPS · LIGHTING EQUIPMENT · RADIO AND TELEVISION RECEIVERS, ETC.

(LD777)

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

CITY OF BELFAST

TENDERS are invited as under:

RUBBER INSULATED CABLES AND FLEXIBLE CORDS

The supply and delivery of rubber insulated cables and flexible cords for twelve months commencing 1 Apr., 1955 (as previously advertised) (Form No. 29).

NOTE: This form is in respect of materials which shall be supplied to any Department of the Corporation.

Form of Tender may be obtained at the Electricity Department, East Bridge St, Belfast, on payment of the sum of ten shillings (non-returnable). Extra copies may be obtained at five shillings each (non-returnable). Cheques should be made payable to the Belfast Corporation Electricity Department.

All letters, catalogues, drawings, etc., accompanying Tenders must be submitted in duplicate.

Tenderers are advised that the Corporation conditions of contract only will apply. Any other conditions put forward by tenderers will not be accepted.

Latest time for receipt of Tenders—4 p.m. on Friday, 25 Feb., 1955.

BLOW-DOWN PIPEWORK

The supply and delivery of blow-down pipework.

Form of Tender and Specification (No. W.68) may be obtained at the Electricity Department, East Bridge St, Belfast.

Latest time for receipt of Tenders—4 p.m. on Friday, 25 Feb., 1955.

The following conditions apply to the above-mentioned Tenders: Each Tender, in sealed envelope marked "Tender for . . ." and endorsed with the name and address of the tenderer must reach the undersigned not later than the time specified.

An official receipt must be obtained for each Tender delivered by hand. Tenders sent by post should be registered.

The lowest or any Tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
P.O. Box 234.
7 Feb., 1955. (P 758)

FRIERN BARNET URBAN DISTRICT COUNCIL

PUBLIC STREET LIGHTING

TENDERS are invited for the supply of street lighting lamps for the year commencing 1 Apr., 1955, of the following types:

(*a*) Metal filament lamps.
(*b*) Sodium vapour lamps and jackets.
(*c*) Mercury vapour lamps.

The Conditions of Contract, Specification and Form of Tender may be obtained from the Engineer and Surveyor, Town Hall, Friern Barnet, N.11.

Tenders must reach the undersigned not later than 9 a.m. on 28 Feb., 1955.

The Council does not bind itself to accept the lowest or any tender.

B. R. OSTLER,
Clerk of the Council.

Town Hall,
Friern Barnet, N.11. (P 707)

ELECTRICITY (ESSENTIAL SUPPLIES) ACT (NORTHERN IRELAND) 1954

City and County Borough of Belfast Electricity Department

TENDERS are invited for the Supply, Delivery and Erection at the First and Second Extensions, Belfast Municipal Electric Power Station West of:

(*a*) 3,300 and 400 V Switchgear and Accessories (Form of Tender N.1630). The first section of the installation is required to be complete by Sept., 1957.

(*b*) Extensions to existing Coal Handling Plant consisting of 150, 300 and 600 tons per hour belt coal conveyors. Existing belt coal conveyors are required to be lengthened, realigned and set in operation and a new reclaiming belt conveyor including feeders, chutes, driving gear and motor, etc., is to be provided. The work includes all supports and equipment necessary to make the extended plant complete and the extensions shall be designed to match up with the existing installation and to fit in with provision made for these extensions.

Forms of Tender, Conditions, Specifications and Drawings, in quintuplicate, may be obtained from Messrs Merz and McLellan, Consulting Engineers, Carliol Hse, Newcastle upon Tyne 1, on payment of a deposit of Five guineas in respect of each item (*a*) or (*b*). These deposits will be refunded provided bona fide tenders are lodged and not withdrawn. Extra copies of the contract documents may be obtained at One guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in quadruplicate, in sealed envelope marked "Tender for . . . Electricity Department" and endorsed with the name and address of the tenderer, must be addressed to the Town Clerk, City Hall, Belfast, so as to reach him not later than 4 p.m. on Thursday, 7 Apr., 1955, in the case of Item (*a*) and Thursday, 24 Mar., 1955 in the case of Item (*b*).

An official receipt must be obtained for each Tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

EYRE GORDON,
Chairman,
Northern Ireland Joint Electricity Committee.

Chichester Hse,
Chichester St, Belfast.
3 Feb., 1955. (P 754)

CITY OF MANCHESTER

HOUSING COMMITTEE

TENDERS are invited for Electrical Installations to 108 Flats and Maisonnettes at Contract 214, Palmerston St, Beswick.

Tender Forms and Schedules may be obtained on application to the Director of Housing, Town Hall, Manchester 2, and must be returned in a sealed official envelope endorsed "Electrical Installations," and be received by the Town Clerk not later than noon on Monday, 28 Feb., 1955.

PHILIP B. DINGLE. (P 757)

COUNTY BOROUGH OF BLACKPOOL

TENDERS are invited for the supply and delivery of the following Street Lighting Equipment:

1. 175 No. Group "A" Prestressed Concrete Columns.
2. 75 No. Reinforced Concrete Brackets for above.
3. 120 No. Group "A" Lanterns.
4. 1,500 No. Group "B" Prestressed Concrete Columns with brackets.
5. 1,350 No. Group "B" Lanterns.
6. 1,500 No. Synchronous Solar Dial Time Switches.
7. 1,250 No. Chokes.
8. 1,375 No. Capacitors.

The Corporation do not bind themselves to accept the lowest or any tender and reserve the right to accept tenders for the whole or any part of the schedule.

Specifications, forms of tender and general conditions may be obtained from the Illuminations and Public Street Lighting Officer, Electrical Services Department, Rigby Rd East, Blackpool.

Separate tenders for each part of the schedule should be addressed to the undersigned in plain, sealed envelopes and should be received not later than 10 a.m. Monday, 28 Feb., 1955.

TREVOR T. JONES,
Town Clerk.

Town Hall,
P.O. Box 11,
Blackpool. (P 755)

GOVERNMENT OF KUWAIT

Department of Electricity

11 kW METALCLAD SWITCHGEAR

TENDERS are invited for the supply and erection of indoor 11 kV Metalclad Switchgear having ratings of 350 and 500 MVA, to be installed in Department of Electricity substations. A single copy of the Tender Documents must be obtained from the President of the Department of Electricity, Government of Kuwait, Kuwait, Arabia Gulf, and will only be available to recognised and accredited Kuwaiti Agents. This copy will be available in Kuwait on 21 Feb., 1955. Additional copies of the documents will be issued direct to Tenderers by the Consulting Engineers in London on receipt of the Authorisation Form from the Government of Kuwait. Tenders must be submitted to the President of the Department of Electricity by 4 Apr., 1955. Notice of the foregoing will be posted on the Notice Board of the Department of Electricity in Kuwait.

Ewbank and Partners Ltd.,
Engineering Consultants.

10/11 Grosvenor Place,
London, S.W.1. (P 706)

SOUTHAMPTON C.B.C.

invites Tenders from Electrical Contractors for ELECTRICAL INSTALLATION at LUDLOW RD INFANTS' SCHOOL to be Sub-Contract with Main Contractor (R.I.B.A. Contract plus Supplemental Conditions available for inspection). Forms and particulars from Borough Architect on £5 deposit by 14 Feb., 1955, refunded on receipt of bona fide Tender not subsequently withdrawn, or return of documents. Tender to the Borough Architect, Civic Centre, Southampton, by 10 a.m. on 28 Feb., 1955. (P 756)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

33 kV SWITCHGEAR FOR KINTORE SUBSTATION, ABERDEENSHIRE

TENDERS are invited for the supply and erection of the above-mentioned switchgear.

Copies of the Tender Document may be obtained from the Engineers, Messrs Merz and McLellan, 72a George St, Edinburgh 2, on receipt of a deposit of £2. 2s. (returnable).

The Board do not bind themselves to accept the lowest or any Tender.

H. W. SIMPSON,
Secretary.

16 Rothesay Terr,
Edinburgh 3. (P 753)

BOROUGH OF BUXTON

STREET LIGHTING—TRUNK ROAD A.6

47 Group "A" 400 W Mercury Units

TENDERS are invited for the following:
(*a*) Supply and erection of steel columns; and supply and installation of lanterns and auxiliary equipment.
(*b*) Supply and erection of steel columns; and installation of lanterns and auxiliary equipment provided by another firm.
(*c*) Supply only of lanterns and auxiliary equipment.

Contract documents may be obtained from, and plans and General Conditions of Contract inspected at, the office of the Borough Engineer, Town Hall, Buxton. A payment of a deposit of £2. 2s. is required for the documents, which is returnable on receipt of a bona fide tender, not subsequently withdrawn.

Tenders in plain sealed envelopes endorsed "A.6 Street Lighting" must be delivered to the undersigned not later than 10 a.m. on Monday, 7 Mar., 1955.

The Council do not bind themselves to accept the lowest or any Tender.

H. C. HOGGETT,
Town Clerk.

Town Hall,
Buxton, Derbyshire.
5 Feb., 1955. (P 761)

METROPOLITAN BOROUGH OF WANDSWORTH

STREET LIGHTING—ROUTE "J"

TENDERS invited for supply and erection of concrete lamp columns and ancillary gear for Groups A and B standard street lighting.

Tender documents, obtainable from the Borough Engineer, must reach me by noon Wednesday, 6 Apr., 1955.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
Wandsworth, S.W.18. (P 762)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

JUNIOR ENGINEER (SHIFT) BARKING "A" AND "B" GENERATING STATION

Vacancy No. 55/102

Sound engineering training necessary with generating station experience. Salary—Class L, Grade 19=£500 per annum.

ASSISTANT ENGINEER (EFFICIENCY) DEPTFORD EAST GENERATING STATION

Vacancy No. 55/103

Candidates should have had sound engineering training. Duties will consist of plant testing, investigation of technical problems and general responsibility for station efficiency. Salary—Class K, Grade 13=£708. 15s. per annum.

GENERAL ASSISTANT ENGINEER (COMMUNICATIONS SECTION) TECHNICAL DEPARTMENT

Vacancy No. 55/104

Candidates should preferably have some experience of private Communications Systems, using line, teleprinter and radio techniques. Manufacturing works experience an advantage. Duties will include the supervision of construction and maintenance work. Salary—Class AX/EX, Grade 6=£630/£845. 5s. per annum.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (P 732)

BRITISH ELECTRICITY AUTHORITY
Southern Division

APPLICATIONS are invited for the following posts:

MAINTENANCE SUPERINTENDENT, MARCHWOOD GENERATING STATION

S/13.620

Applicants should have had considerable experience of the maintenance of plant in a large modern generating station with high temperatures and pressures, preferably with pulverised fuel and/or oil fuel equipment.

Preference will be given to corporate members of one of the senior professional engineering institutions, or those holding appropriate equivalent qualifications.

Salary, N.J.B., Grade K.6—£1,035 x £30 £1,125.

ASSISTANT SHIFT CHARGE ENGINEERS, MARCHWOOD GENERATING STATION

S/13.621

Applicants should have had previous experience in a large modern generating station, preferably one with high operating temperatures and pressures, and pulverised fuel or oil fuel equipment. Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional engineering institution, or those holding equivalent qualifications.

Salary, N.J.B., Grade K.9—£840 x £20—£900.

ASSISTANT ENGINEERS (GRADE 10), MARCHWOOD GENERATING STATION

S/13.619

Those appointed may be required to perform the duties of a station shift control engineer, to assist on maintenance work, or to perform general station duties. Previous experience of modern generating station plant is essential.

Applicants should have had a sound technical training and should possess qualifications leading to corporate membership of an appropriate professional institution, or hold equivalent qualifications.

Salary, N.J.B., Grade K.10—£790 x £20—£850.

SHIFT CHARGE ENGINEER, WEYMOUTH GENERATING STATION

S/13.622

Applicants should have had previous operating experience in a generating station, involving some degree of responsibility.

Salary, N.J.B., Grade B.7—£595 x £15—£640.

JUNIOR ENGINEERS

S/13.618

Applicants should have served an apprenticeship or had practical training suitable to the industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those nearing completion of H.N.C. courses). Opportunities are available for junior engineers to complete their studies and gain wide experience with good prospects of promotion.

The duties of those appointed will vary, but will include, as a general rule, the operation and control, under supervision, of generating plant.

Vacancies also exist for those who wish to specialise in maintenance of electrical and mechanical generating plant, transmission lines, substations and cables, or generating station construction work.

Salary, N.J.B., £475/£590.

Special application forms for each of the above posts, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 23 Feb. Please quote reference ET. (P 743)

BRITISH STANDARDS INSTITUTION

CHARTERED ELECTRICAL AND MECHANICAL ENGINEERS are required at Technical Officers by the British Standards Institution. They will act as Secretaries to committees dealing with subjects in the fields of electrical and mechanical engineering. Aptitude for committee work is essential.

The salary of the posts of this grade is at present £650 to £1,000 the starting salary dependent on qualifications and experience. The positions are pensionable. Apply in writing to the Establishment Officer, B.S.I., 2 Park St, London, W.1. (P 747)

SOUTH EASTERN ELECTRICITY BOARD

SEEBOARD will shortly appoint a CHIEF COMMERCIAL OFFICER on the retirement of Mr C. F. Wells, M.I.E.E., A.M.I.I.A., from that position.

Applications are invited from men who, in addition to being Corporate Members of the Institution of Electrical Engineers, have a wide knowledge and experience of commercial practice, particularly in the electricity supply industry.

The successful applicant will be responsible to the Board for all phases of commercial development including the design and operation of tariffs, selective development of electricity load, and the management of showroom and contracting activities.

The salary for the post, which will be superannuable, will be within the range of £2,500 to £3,000 per annum. Applications, naming 2 referees, must reach me at 10 Queen's Gdns, Hove 3, Sussex, by 14 Mar., 1955. A form, which I will send on request, must be completed and submitted with each application.

A. L. BURNELL,
Secretary.
(P 736)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Northmet Sub-Area:

Tottenham District

GENERAL ASSISTANT ENGINEER

22/55.N

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.

Salary in accordance with Class E, Grade 11, of the National Joint Board Agreement commencing at £555 plus London Allowance.

Apply to the District Manager, Eastern Electricity Board, 312 High Rd, Tottenham, London, N.15.

Harrow District

JUNIOR ENGINEER

23/55.R

Candidates should have had a good general and technical education, and should possess the Higher National Certificate in Electrical Engineering or an equivalent qualification.

Salary in accordance with Class F, Grade 14, of the National Joint Board Agreement, commencing at £475 plus London Allowance.

Apply to the District Manager, Eastern Electricity Board, 4 College Rd, Harrow, Middlesex.

Future salaries and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. (P 740)

NORTH STAFFORDSHIRE TECHNICAL COLLEGE
Stoke-on-Trent

Principal: H. W. Webb, O.B.E., D.SC.

APPLICATIONS are invited for the post of full-time ASSISTANT LECTURER (Grade B) in ELECTRICAL ENGINEERING. Applicants must hold an Engineering degree or equivalent, and have had some practical experience. Qualifications in power subjects and/or electronics would be an advantage.

Burnham Scale salary: Basic £525/£25/£820, plus full allowances for training, graduate qualifications and industrial experience which may, with suitably qualified candidates, bring the maximum up to £964 per annum.

Applications giving details of training, qualifications and experience, should be sent to the Principal as soon as possible.

H. DIBDEN,
Clerk to the Governors.
(P 731)

MUNICIPALITY OF GEORGE TOWN, PENANG
Federation of Malaya

SENIOR POWER STATION ENGINEER

THE MUNICIPAL COUNCIL invites applications for a vacancy in the permanent establishment of the Electricity Supply Department. The duties of the post include organisation and supervision of mechanical maintenance work on Boilers, Turbines and usual auxiliary plant but not responsibility for electrical maintenance or taking charge of shifts.

Candidates should be experienced in the operation of modern steam turbine and boiler plant (either in a power station or on board ship) with steam conditions of 400 p.s.i./8800° F or higher, and should preferably be between the ages of 25 and 45.

Appointment in the first instance will be for a term of three years in the salary scale of (*a*) $510-30-750/780-30-1,020 per month or (*b*) $528-36-852/912-36-1,200 per month according to qualifications. ($1=2s. 4d.) In addition allowances payable at present rates raise the annual emoluments on the minimum and maximum points of the above scales to the following:

		min.	*max.*
For a bachelor	Scale (*a*)	£1,197	£1,862
For a bachelor	Scale (*b*)	£1,218	£2,100
For a married man	Scale (*a*)	£1,407	£2,247
For a married man	Scale (*b*)	£1,440	£2,499
For a married man with children	Scale (*a*)	£1,498	£2,471
For a married man with children	Scale (*b*)	£1,531	£2,730

Free passages to Penang for the successful candidate, his wife and children under the age of twelve years will be provided and upon completion of the first tour of service (3-4 years) free homeward passages will similarly be provided.

The Municipal Council at present operates a scheme of medical benefits for officers and their families which includes treatment at modern and well-equipped Government Hospitals.

Housing accommodation (including heavy furniture) will be provided at a nominal rental (at present not more than $35 per month).

The successful candidate will be required to contribute to a Provident Fund 10% of his basic salary and expatriation allowance during the first five years' service and thereafter 15%. The Council donates an equal amount. An officer who has completed five years' service with the Council is entitled upon resignation from the service to be paid the sum of the Council's donations and his own contributions together with accrued interest on both sides.

The Council's leave regulations provide for fourteen days' local leave each year plus generous home leave upon completion of each tour of service. The normal length of tour varies from two years to a maximum of four years depending on the age and length of service of the officer.

Applications in Duplicate, giving full particulars of education, technical training, qualifications, practical and executive experience together with copies of three recent testimonials (also in duplicate) should be sent to Messrs Allen and Williams (Agents to the Municipal Council), 1 Victoria St, London, S.W.1, before 10 Mar., 1955.

(P 701)

THE NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF
SECOND ASSISTANT
DISTRICT COMMERCIAL ENGINEER
(SALES SUPERINTENDENT), CHORLEY

THE successful applicant will be required to assist the District Commercial Engineer in all normal sales activities. He will be responsible for supervising the organisation of Service Centres, exhibitions and publicity and the work of outdoor and indoor sales personnel. Experience in Agricultural and Horticultural development will be an advantage.

Salary Scale: £755 x £15—£800 per annum. Grade F.7. N.J.B. Conditions.

Applications to the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune St, Preston, by 19 Feb., 1955.

Note.—Persons who applied in response to the previous advertisement for this post need not re-apply. (P 700)

BRITISH ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following posts:

JUNIOR ENGINEER
PETERBOROUGH GENERATING STATION

Salary Class F, Grade 14, £475 x £15—£520 per annum.

The duties of the successful applicant will include assisting in the Control Room on shift and other operation and investigation duties.

Preference will be given to applicants who have had previous experience in a Generating Station upon similar work and who have had technical training to Ordinary National Certificate standard or equivalent in Electrical Engineering.

STATION SHIFT CONTROL ENGINEER
GREAT YARMOUTH GENERATING STATION

Salary Class D, Grade 10, £555 x £15—£600 per annum.

Applicants should have reached the standard of Ordinary National Certificate in Electrical Engineering or its equivalent, have experience in the operation of a Switchboard at a Generating Station and be fully conversant with High Tension Switching operation and protective systems.

Applications giving details of age, qualifications, experience and present position should be submitted to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, not later than 19 Feb., 1955.

W. N. C. CLINCH,
Controller.
(P 727)

YORKSHIRE ELECTRICITY BOARD
No. 5 (Wakefield) Sub-Area

SECOND ASSISTANT ENGINEER (LARGE POWER SALES & GENERAL DEVELOPMENT)

APPLICANTS must be conversant with all matters connected with the commercial organisation of an industrial district or Sub-Area and have experience in tariff interpretation, negotiations with large power consumers, and in general development work.

Salary—N.J.B. Class K, Grade 7, £975/£25/£1,050 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 24 Feb., 1955.

No. 2 (Huddersfield) Sub-Area

Halifax District
DISTRICT SENIOR COMMERCIAL ASSISTANT (CLECKHEATON)

The successful applicant will be required to act, under the supervision of the Halifax District Commercial Engineer, as Local Manager at Cleckheaton. Candidates should be widely experienced in Commercial matters, Control of Service Centres and in Public Relations. Clerical and administrative experience will be an advantage.

Salary—N.J.C. Grade 6, £795/£25/£870 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market St, Huddersfield, not later than 24 Feb., 1955. (P 728)

ATHENS PIRAEUS ELECTRICITY COMPANY LTD.
Athens, Greece

THE Athens Piraeus Electricity Company, which is under British management, has a vacancy in Athens for a really first-class young BRITISH ELECTRICAL ENGINEER (in his twenties) with sound theoretical and practical knowledge of steam power engineering. Applicants should be fully qualified, preferably with a good honours degree. They must be of the type who can command the respect and friendship of able and experienced Greek engineers working for the company, as well as of the British staff. A substantial salary can be paid to the right man. Reply to the Secretary of the company's London agents, Whitehall Securities Corporation Ltd., 47 Parliament St, London, S.W.1. (P 733)

ELECTRICITY AUTHORITY OF CYPRUS

ELECTRICAL ENGINEER

THE Electricity Authority of Cyprus require an Electrical Engineer for two tours each of 2 years with prospect of permanency. Commencing salary in scale £1,200 rising to £1,500 a year according to qualifications and experience. Free furnished quarters and passages. Liberal leave on full salary. Candidates, between 28 and 40, must have had sound training in both electrical and mechanical engineering with experience in the practical and administrative operation of electricity supply undertakings. They should possess competent knowledge of the operation and maintenance of 33 kV or 66 kV systems and the erection and maintenance of high and low voltage overhead and underground A.C. transmission systems, networks and substation plant. Preference will be given to Corporate Members of the Institution of Electrical Engineers.

Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40498/EE. (P 724)

TEMPORARY TECHNICAL OFFICER
(Electrical)

required for their London Office by the Crown Agents for Oversea Governments and Administrations. Salary including Pay Supplement and Extra Duty Allowance £1,002 rising to £1,115 a year. Candidates, up to 55 years of age, should have passed the qualifying examination for Associate Membership of the Institution of Electrical Engineers or an equivalent examination. They must have served a regular electrical engineering apprenticeship and have had experience overseas, preferably including the lay-out of medium-sized power stations, diesel and steam-driven. A knowledge of consumers installations both industrial and domestic would be an advantage, as would previous contract experience. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2A/40575/EE. (P 725)

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Wear Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER, Crook District.

Salary—Schedule A, Class D, Grade 9, £595/£640. N.J.B. conditions of service.

Harrogate Sub-Area

DISTRICT COMMERCIAL ASSISTANT, Harrogate District.

Applicants should have a good knowledge of electrical appliances with experience in tariffs, sales and other service centre duties.

Salary—Grade 3, £585/£645, N.J.C. (Administration and Clerical Grades) conditions of service.

Applications stating age, qualifications and experience should be forwarded to The Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (P 742)

LEEDS COLLEGE OF TECHNOLOGY
Principal: C. Chew, M.Sc.Tech., F.R.I.C.

DEPARTMENT OF ELECTRICAL ENGINEERING AND PHYSICS

APPLICATIONS are invited for an appointment as Lecturer in Electrical Engineering, duties to commence on 2 May next, or as soon as possible thereafter.

Applicants should possess a good Honours degree or equivalent qualification together with teaching and industrial experience in Telecommunications or Electronic engineering. Salary in accordance with the Burnham Scale for Lecturers, viz. £965 x £25 to £1,065 per annum.

Further particulars and form of application to be returned not later than 24 Feb. may be obtained by sending a stamped addressed envelope to the undersigned.

GEORGE TAYLOR, M.A.
Chief Education Officer.

Education Department,
Leeds 1. (P 739)

BRITISH ELECTRICITY AUTHORITY
North Eastern Division

APPLICATIONS are invited for appointment of THIRD ASSISTANT ENGINEER in the Transmission Department, Mosley St, Newcastle upon Tyne 1.

Applicants should have had a fundamental training in electrical engineering and preferably experience in the manufacture, erection, maintenance and operation of electrical plant as installed in the modern Power Stations.

The salary for the appointment (which is superannuable) will be in accordance with Grade 4, Schedule C, of the National Joint Board Agreement (£750/£950 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Divisional Establishments Officer, British Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne 1, to whom they should be returned to arrive not later than 1 Mar., 1955. (P 759)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

JUNIOR ENGINEERS—FREEMEN'S MEADOW POWER STATION, LEICESTER

Vacancy No. 27/55/ET

SOME experience in Control Room and Boiler House work in a large P.F. Station is required. Technical qualifications up to H.N.C.

Salary in accordance with Class H, Grade 16 (£475 x £15—£520 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 21 Feb., 1955.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
(P 737)

LONDON ELECTRICITY BOARD

ENGINEER
(OPERATION AND MAINTENANCE)

APPLICATIONS are invited for the above position in the Poplar District of the Northern Sub-Area.

Applicants should have had a sound technical education up to at least National Certificate standard, with practical experience in general mains work both D.C. and A.C., including installation and maintenance of distribution systems, also the preparation and keeping of associated records.

The post is graded under Schedule "A" of the National Joint Board agreement as Class E, Grade 11—£582. 15s. per annum, rising to £630 per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46/7 New Broad St, E.C.2, to be returned completed by 17 Feb., 1955. Please enclose addressed envelope and quote ref.: V/1888/T on envelope and all correspondence. (P 699)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside & N. Wales Division

VACANCY No. E.79/48/T.—ASSISTANT SHIFT CHARGE ENGINEER, Chadderton "B" Generating Station, nr. Oldham. Salary £715 x £15—£760 (G.9).

Vacancy No. E.79/49/T. — DEPUTY POWER STATION SUPERINTENDENT, Westwood Generating Station, Wigan. Salary £1,035 x £30—£1,125 (G.3).

Vacancy No. E.79/51/T.—ASSISTANT ENGINEER (Technical), Connah's Quay Generating Station, N. Wales. Salary £635 x £15—£680 (G.11).

Applications, quoting Vacancy No. to Divisional Secretary, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 19 Feb. (P 726)

SOUTH WALES ELECTRICITY BOARD

REQUIRED two ASSISTANT ENGINEERS, District 462 (Newport), Eastern Sub-Area.

The salaries for the positions will be Class F, Grade 7 (£755/£800) and Class F, Grade 8 (£715/£760) of N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 19 Feb., 1955.

D. G. DODDS,
St. Mellons, Secretary.
Cardiff. (P 741)

SOUTH WESTERN ELECTRICITY BOARD

SECOND ASSISTANT DISTRICT ENGINEER
(PLANNING) EXETER

SALARY N.J.B. Class E, Grade 7—£715/£760 per annum.

Duties include forward planning for development within the District; preparation of detailed plans for new schemes, including capital applications; serving of statutory notices, etc., for new development and reinforcements. Possession of H.N.C. is desirable.

Application forms obtainable from Manager, Exeter District, 46 North St, Exeter, should be returned by 22 Feb., 1955. (P 738)

NORTH WESTERN GAS BOARD
Manchester Group

FOREMAN ELECTRICIAN—SALFORD WORKS

APPLICATIONS are invited from suitably qualified persons for the above pensionable appointment at a salary within Grade A.P.T.6 (£530/£610 per annum).

Applicants must have experience of the maintenance of L.T. and H.T. electric motors and switchgear and be capable of organising routine electrical maintenance for gas works.

Detailed applications, giving names of two referees, should reach the General Manager, N.W.G.B. (Manchester Group), Town Hall, Manchester 2, within 14 days. (P 735)

MANCHESTER CORPORATION
Transport Department

TECHNICAL ASSISTANT (Electrical) required in the Chief Engineer's Section at a salary of £560/£640 per annum. Candidates should possess technical qualifications not less than the Higher National Certificate, and preferably Graduate Membership of the Institute of Electrical Engineers. Forms of application together with full details of the duties attached to the post can be obtained from the General Manager, Manchester Corporation Transport Department, 55 Piccadilly, Manchester 1, and should be submitted to him with the names of two referees not later than Wednesday, 2 Mar., 1955. Canvassing is prohibited. (P 763)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Shropshire and Herefordshire Sub-Area

SENIOR ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Applicants should have sound technical and practical knowledge of the operation and maintenance of overhead and underground systems up to 66 kV, commissioning of major substations, protection testing, etc. Preference will be given to candidates with appropriate technical qualifications. Salary £975/£1,050 per annum (N.J.B. Grade G.4).

SENIOR ASSISTANT ENGINEER
(CONSTRUCTION)

Applicants should have wide technical and practical experience in the construction of overhead and underground systems, including substations, up to 66 kV, also operation of the Sub-Area transport fleet and supervision of Civil Works, etc. Preference will be given to candidates with appropriate technical qualifications. Salary £975/£1,050 per annum (N.J.B. Grade G.4).

SECOND ASSISTANT ENGINEER
(MAINTENANCE)

Applicants should have a wide technical and practical training in maintenance of plant, protection, etc. for systems up to 66 kV. Preference will be given to candidates with appropriate technical qualifications.

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Salary £790/£850 per annum (N.J.B. Grade G.7).

SECOND ASSISTANT ENGINEER
(PLANNING)

Applicants should have a wide technical and practical experience of planning major systems up to and including 66 kV, both overhead and underground, technical calculations, protective systems, etc. Preference will be given to candidates with appropriate technical qualifications. Salary £790/£850 per annum (N.J.B. Grade G.7).

Apply, in writing, clearly stating vacancy for which application is being made, within 14 days stating age, qualifications, and experience to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

Worcester and District Sub-Area

DISTRICT COMMERCIAL ENGINEER.
(WORCESTER DISTRICT)

Applicants should have had extensive practical experience in industrial, agricultural and domestic load development in rural and urban areas, including preparation of specifications and the completion of tenders for large wiring contracts, supervision of contracting department, sales of electrical equipment, service and advice to consumers, and standardisation of voltage. Technical qualifications desirable. Salary £900/£975 per annum (N.J.B. Grade F.4).

Apply, in writing, within seven days stating age, qualifications, present position and salary to Mr R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

Birmingham and District Sub-Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER
(SOUTH EAST DISTRICT)

Applicants should possess a sound technical training and have a wide practical experience of industrial, commercial and domestic installations and their electrical requirements. The duties will include advice on utilisation, negotiations with consumers for supplies of electricity, preparation of estimates etc., supervision of contracting work, service centres and consumer service. Technical qualifications desirable. Salary £840/£900 per annum (N.J.B. Grade G.6).

Apply, in writing within 14 days stating age, experience, present salary and position to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14 Dale End, Birmingham 4.

A. STEPHENS,
Secretary.
(P 760)

A SPECIAL REPRESENTATIVE with a thorough knowledge of Electrical Accessories and Cables is required for the London and Home Counties Area by Volex Electrical Products Ltd., Salford 6. He must have an established connection with Architects, Contractors, Electrical Authorities and Wholesalers. Salary, commission, expenses and car provided. Pension scheme in operation. Applications in confidence to Mr H. Finch, Sales Promotion Director. (P 729)

A VACANCY has arisen on the Staff of The General Electric Co., Ltd., at the Head Office of their Sales organisation for a young man approximately 25 years of age who has at least the O.N.C. in electrical engineering. The work available is connected with electric furnaces and preference will therefore be given to those having had previous experience in this direction or in metallurgy. Apply in writing, quoting Ref. P.H. to the Staff Manager, The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. (P 744)

ASSISTANT with technical qualifications required by Metropolitan-Vickers Electrical Company Limited, Trafford Park, Manchester 17, to train as Industrial Information Officer; experience of this type of work is not essential. Salary will depend on qualifications and experience and will be progressive. Write, giving full particulars, including age, sex, nationality, education and experience, to the Personnel Manager, marking envelope "H2." (P 751)

A PRODUCTION ENGINEER is required in the East for work involving responsibility for production of fans and motors up to 50 h.p. which is the main production of a factory employing a thousand personnel. It is a senior appointment where previous experience is essential and gives good future prospects for advancement. Maximum age considered 37 years. Applications in writing, giving full details of age, qualifications and experience, should be addressed to The Staff Manager, The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. (P 716)

AIR MINISTRY Works Designs Branch requires in London and Provinces (with liability for overseas service) ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution H.V. and M.V. Technical training to O.N.C. standard or equivalent an advantage. Salaries up to £810 per annum starting pay dependent on age, qualifications and experience. Overtime or extra duty allowance payable. Posts non-pensionable with long-term possibilities. Natural-born British subjects only. Write stating age, qualifications, employment details including type of work done to Ministry of Labour, 236 Walworth Road, London, S.E.17, quoting Order 85/BD. (P 723)

ABSTRACTOR required for Engineering and Physics subjects by Metropolitan-Vickers Electrical Company Limited, Trafford Park, Manchester 17. Progressive opportunities for one who has ability for concise expression; is interested in new developments and in writing up technical matter. Engineering experience would be an advantage initially, but experience in abstracting not essential. Apply in writing, to the Personnel Manager, giving details of technical qualifications, experience, if any, and present salary. Mark envelope "F1." (P 750)

ASSISTANT POWER STATION ENGINEER required for service with Sudan Light and Power Co., Ltd., in Khartoum, Sudan. Basic salary on appointment within the range £E.900/£E.1,380 per annum, according to qualifications and experience. (£E.1=£1. 0s. 6d.)

Candidates, who should preferably be under 45 years of age, must be of good general education, have served an apprenticeship with a well-known firm of Diesel Engine Manufacturers and have had considerable subsequent experience in the operation and maintenance of medium speed 2-stroke Diesel Generating Sets and/or high speed turbo charged Sets of up to 1,800 h.p. each. Knowledge and some experience in Switchboard operation, 6·6 kV and 11 kV would be an added qualification.

Duties would include the maintenance of seven English Electric Fullagar type Diesel Generating Sets and seven English Electric 16 cylinder V formation turbo charger Sets with all associated auxiliary equipment. The candidate chosen must also be prepared to act as a Shift Charge Engineer, if called upon to do so.

The training of Sudanese employees will be part of the duties of the person chosen.

Appointment will be on contract by arrangement up to five years, including a period of 12 months' probation, with a bonus payable on completion of the contractual period. Free living accommodation with basic furniture or an allowance in lieu thereof, will be provided. After satisfactory completion of the probationary period liberal leave on full salary with free passages will be granted. In addition to basic salary a cost of living allowance will be payable, and a kit allowance of £E.50 on appointment.

Applications stating age, education, qualifications, experience (with particulars of posts held), present appointment with salary and names of two references should be submitted to The Secretary, The Power and Traction Finance Co., Ltd., Queens House, Kingsway, London, W.C.2. (P 719)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

A WELL known Manchester engineering company has a limited number of vacancies for TRAINEE DRAUGHTSMEN. The following qualifications and experience are essential: A full apprenticeship in mechanical or electrical engineering and successful completion of S.2 Ordinary National Certificate. Age 21-26. Applicants must have completed National Service. Write giving full particulars of age, qualifications, experience, and marking envelope "Trainee Draughtsman," to—Box No. 4223, Electrical Times. (P 629)

BRITISH ELECTRICITY AUTHORITY require power station ASSISTANT SWITCHBOARD ATTENDANT with preferably D.C. and rotary plant experience, also good knowledge of figures. N.J.I.C. rates and conditions, including holiday and sick pay schemes. Application to Superintendent, Taylors Lane Power Station, London, N.W.10. (P 710)

BRUCE PEEBLES AND CO., LTD., Engineers, Edinburgh 5, have vacancies in their Transformer Department for the following appointments: SENIOR TRANSFORMER DRAUGHTSMEN capable of personally undertaking the electrical and mechanical layout of transformers up to 30 MVA at 132 kV. Good opportunities to broaden experience by working on layout of larger and higher voltage units. CONTROL GEAR DRAUGHTSMEN with experience in electrical and mechanical layout of switchgear and/or transformer control panels. Salaries commensurate with experience and qualifications; permanent appointments, with Pension and Production Bonus Schemes; five-day week; assistance in obtaining house accommodation. Applications to Mr R. W. Flux, Manager, Transformer Department at above address. (P 746)

CABLE ESTIMATOR required preferably with knowledge of mains cable and bare copper. Write: Edison Swan Electric Co., Cable Department, 155 Charing Cross Rd, W.C.2. (P 641)

CABLE ESTIMATOR required for permanent, progressive position with established manufacturing company abroad. Minimum 10 years' experience in detailed estimating and pricing of electric power cable and dry core telephone cable essential. Single man preferred. Pension and other amenities available. Passage paid for successful candidate.—Box No. 4257, Electrical Times. (P 720)

DESIGN DRAUGHTSMAN required by Company in North London Area to work under direction of qualified engineer on design and development of electro-mechanical products for the electrical, aircraft and automobile industries. Knowledge of mass production methods, tooling and manufacturing tolerances is essential and some electrical knowledge is desirable. He will be responsible for the maintenance and organisation of drawing office records. Full details of experience required.—Box No. 4255, Electrical Times. (P 708)

ELECTRICAL ENGINEER, age 25 to 30, Graduate essential, preferably from full-time University Course with some experience of light current supervisory equipment, required at our Weybridge Office for detailed engineering and contract work on E.H.T. transmission equipment and supervisory control. Apply Kennedy and Donkin (ref.: MVR), 12 Caxton St, London, S.W.1. (P 646)

ENGINEER required, age 25-35; estimating for and supervising contracts with large electrical contracting and engineering firm in London. Full details to—Box No. 4259, Electrical Times. (P 749)

ESTIMATORS for Indoor Sales Staff required by Crompton Parkinson Ltd., Chelmsford. Applicants must have initiative and be experienced in dealing with enquiries relating to A.C. and D.C. rotating electrical machinery up to 1,500 h.p./kW. Superannuation scheme, and extensive social, sports and welfare facilities. Write giving fullest particulars to the Personnel Officer. (P 721)

JOHNSON AND PHILLIPS LTD.

APPOINTMENT OF
CHIEF RUBBER CABLE TECHNOLOGIST

Applications are invited for the position of Chief Rubber Cable Technologist at our London factory.

Applicants must possess extensive experience in the design and manufacture of rubber and thermoplastic cables with intimate knowledge of materials and compounds.

The duties involve responsibility for all routine technical work relating to rubber cables and materials and for research and developments.

The appointment will carry a good salary with the benefits of generous pension and benevolent schemes.

Applications, which will be treated in strict confidence, should give full particulars of education, training, experience and age, and should be addressed to the Managing Director, Victoria Works, Charlton, London, S.E.7. (P 582p)

ELECTRICAL SUPERVISOR required for service with Wad Medani Light and Power Co., Ltd., in Wad Medani, Sudan. Basic salary on appointment within the range of £E.900/£E.1,380 per annum according to age, qualifications and experience. (£E.1=£1. 0s. 6d.)

Candidates should have had considerable experience on the construction and maintenance of H.T. and L.T. distribution systems of 3,000 V and 415/240 V respectively and of installation work in buildings. A knowledge of electric motors and starters, electrical pumping equipment and power station experience would be added qualifications. Preference will be given to applicants having a National Certificate of Electrical Engineering, and a good general education is essential.

Duties will include responsibility for the maintenance of 3,000/230 V electrical distribution system carrying a maximum demand of 800 kW, the planning and execution of extensions to the system and change over from 230 V, 3-phase, 3-wire unearthed to 415/240 V, 3-phase, 4-wire earthed system on the M.V. side. The applicant chosen will also have to plan and supervise electrical installation work in all Government buildings and assist in the maintenance and operation of the power station main and auxiliary equipment and the electric pumping plant in the Company's water works; he will also be required to undertake the training of Sudanese staff as part of his duties.

Appointment will be on contract by arrangement up to five years, including a period of 12 months' probation, with a bonus payable on completion of the contractual period. Free living accommodation with basic furniture or an allowance in lieu thereof, will be provided. After satisfactory completion of the probationary period liberal leave on full salary with free passages will be granted. In addition to basic salary a cost of living allowance will be payable, and kit allowance of £E.50 on appointment.

Applications stating age, education, qualifications, experience (with particulars of posts held) present appointment and salary with names of two references should be submitted to The Secretary, The Power and Traction Finance Co., Ltd., Queens House, Kingsway, London, W.C.2. (P 717)

ENGINEER—preferably with experience in design office, planning department and tool room is required for work in the East by The General Electric Co., Ltd. The position will entail the control and development of a design office where modifications are made to home designs to suit local conditions and a knowledge of production methods and estimating would be an advantage. Preference will be given to candidates aged 25-30 with a good electrical training and sound mechanical knowledge. Career prospects are excellent for a man who is ambitious and prepared to work hard. Apply in writing, giving full details to the Staff Manager, Magnet House, Kingsway, London, W.C.2. (P 715)

ENFIELD CABLES LIMITED have a vacancy in their CONTRACTS SALES DEPARTMENT in London. Applicants should have experience of tendering for cable installation work in this country, and experience of handling Export enquiries of similar nature will be an advantage. Applications should be addressed to Manager, London Sales Office, Enfield Cables Limited, Victoria House, Southampton Row, London, W.C.1. (P 651)

FOREMAN ELECTRICAL FITTER required for service with Sudan Light and Power Co., Ltd., in Khartoum, Sudan. Basic salary on appointment within the range of £E.804/£E.1,284 per annum according to age, qualifications and experience. (£E.1= £1. 0s. 6d.)

Applicants, who should preferably be under 45 years of age, should be of good general education and have served a complete apprenticeship with a well-known firm of switchgear manufacturers and have had at least three years' subsequent experience in the installation and maintenance of switchgear and equipment of various types up to 11 kV.

Preference will be given to applicants in possession of Ordinary National Certificate or other equal technical qualification.

Duties will include the installation and maintenance of Power Station and substation switchgear, transformers and rectifiers operating on voltages up to 11 kV. A knowledge of maintenance of electric motors and starters would be an added qualification. The candidate chosen will be required to undertake the training of Sudanese employees as part of his duties.

Appointment will be on contract by arrangement up to five years, including a period of 12 months' probation, with a bonus payable on completion of the contractual period. Free living accommodation with basic furniture will be provided or allowance paid in lieu thereof. After satisfactory completion of the probationary period liberal leave on full salary with free passages will be granted. A cost of living allowance will be payable in addition to basic salary. A kit allowance of £E.50 will be paid on appointment.

Applications stating age, education, qualifications, experience (with particulars of posts held) present appointment and salary with the names of two references should be submitted to The Secretary, The Power and Traction Finance Co., Ltd., Queens House, Kingsway, London, W.C.2. (P 718)

INFORMATION OFFICER required to assist in technical information for research engineering and commercial departments of a large electrical engineering firm in the North West. Qualifications in engineering are essential. Experience in industrial information work and knowledge of French or German would be advantageous. Salary will depend on qualifications and experience. Advancement will be rapid for the right type of applicant. Reply, giving particulars of training and experience to—Box No. 4263, Electrical Times. Mark envelope "Information." (P 752)

JOINTER (E.H.T.) required by LONDON ELECTRICITY BOARD in Construction Branch of North Western Sub-Area based at Kilburn, N.W.6. N.J.I.C. rates and conditions—4s. 5d. per hour. Application forms from Personnel Officer, 46/7 New Broad St, E.C.2. Please enclose addressed envelope and quote ref.: M/3585/T. (P 714)

JUNIOR TECHNICAL ASSISTANT (20-25) for the preparation of lighting schemes, Illuminating Engineering Dept., old established manufacturers lighting equipment. State age, experience, salary required. Chief Engineer, Technical Service Dept., Holophane Ltd., Elverton St, Westminster, S.W.1. (P 764)

LONDON Consulting Engineer requires ELECTRICAL ENGINEER for design of installation work in factories, schools, office buildings, etc. Previous experience in Consultants or similar establishment an advantage. Superannuation Scheme. Write stating age, experience, qualifications and salary required to G. H. Buckle and Partners, 2 Harrington Gardens, London, S.W.7. (P 748)

LONDON export department of switchgear control gear manufacturers require SALES ENGINEER to deal with estimates, tenders, overseas correspondence; interesting and progressive position write—Box No. 4229, Electrical Times. (P 654)

METROPOLITAN-VICKERS ELECTRICAL COMPANY LIMITED, Trafford Park, Manchester 17, have vacancies in the Research Department for TECHNICAL ASSISTANTS for development work on electrical INSULATING MATERIALS and VARNISHES. Applicants should not be over age 27 and should have technical knowledge or experience of electrical engineering. Apply to the Personnel Manager, marking envelope "W." (P 652)

OVERHEAD LINE ENGINEERS required by Consulting Engineers for supervision of power transmission and distribution schemes in North Scotland. Applicants should have had experience in the design and construction of wood pole lines up to 33 kV. Salary according to experience. Applications, together with details of education, training and experience, should be sent to Messrs Kennedy and Donkin, 3 North Charlotte St, Edinburgh, 2. (P 642)

PIRELLI-GENERAL CABLE WORKS Ltd. have SALES DEPARTMENT STAFF VACANCIES for General correspondence and preparation of Mains Cable Tenders. Apply in writing to Sales Manager, Leigh Rd, Eastleigh, Hants. (P 552)

POWER TRANSFORMER DRAUGHTSMAN required having thorough knowledge of units up to 20 MVA. Full particulars giving age, experience and salary required to—Box No. 4251, Electrical Times. (P 704)

REPRESENTATIVE required by industrial electrical and mechanical repair specialists, for the London district. Applications in confidence to London Sales Manager, Dowding and Mills Limited, 26 White Post Lane, London, E.9. (P 637)

SALES ENGINEER required for London and Southern Counties by progressive company manufacturing Switchgear and Distribution equipment. Applicants should preferably have had experience in the manufacture, installation and operation of distribution equipment for MV and HV systems. Write, giving full particulars of experience, age and salary required to—Box No. 4219, Electrical Times. (P 627)

STATION ENGINEERS required by Air Ministry at R.A.F. and M.C.A. stations. Qualifications and experience required: (*a*) Ordinary National Certificate in Electrical Engineering or equivalent standard of technical education. (*b*) Recognised apprenticeship in electrical engineering. (*c*) at least three years' responsible engineering employment preferably on operation and maintenance of mine, factory or workshop plant and services. Supervisory experience an advantage as duties entirely supervisory and cover installation, operation and maintenance of high and medium voltage distribution system, internal electrical installations, and other miscellaneous installations, tools and equipment. Commencing salary according to age, qualifications and experience on range from £535 to £772. Appointments include liability for service overseas for which special allowance payable in addition to higher salary. Appointments non-pensionable. Only natural-born British subjects. Write, giving age, full details of qualifications and experience to A.B.1255/ME, Appointments Officer, Ministry of Labour and National Service, 1-6 Tavistock Sq, W.C.1. No original testimonials should be sent. Only candidates selected for interview will be advised. (P 722)

SWITCHGEAR DRAUGHTSMEN required (Senior and Junior) for work on H.V. Outdoor Air-break Switchgear and/or 11 kV Oil Immersed Metal-clad Switchgear. Assistance given if required in connection with living accommodation. Apply in writing giving details of experience, qualifications and salary required to Switchgear and Equipment Limited, Banbury, Oxon. (P 703)

SALES ENGINEERS, automatic control gear and switch fuse gear, required operating in the Lancashire, Yorkshire, and Birmingham areas. Must have confidence in own ability and capacity for hard and sustained work. Outside sales experience essential. Salary commensurate with qualifications and experience. Apply in writing only to the Sales Manager, The Donovan Electrical Co., Ltd., Granville St, Birmingham. (P 687)

SALES REPRESENTATIVE N.E. COAST, domiciled Newcastle-on-Tyne area, required by electrical manufacturers. Wiring accessories and L.T. distribution equipment. With electrical training and experience, preferably of installation practice. Sales experience. Driving and correspondence. Medical examination. Salary, commission, contributory pension, expenses, car. Informative letter with recent photo, confidentially to—Box No. 4203, Electrical Times. (P 556)

SKILLED ELECTRICIANS required for maintenance of large motors, starters, automatic contactor gear and distribution switchgear in large paper mills in North Kent. Must be experienced in fault finding and able to read drawings and wiring diagrams. Permanent employment for the right men. Pension scheme, canteen facilities and sports club. Apply stating age, training and experience, to—Box No. 4247, Electrical Times. (P 695)

TECHNICAL ASSISTANT required for their London Head Office by a leading Electric Cooker Manufacturer for an interesting and progressive position.

Minimum qualifications: INTER B.SC. Engineering and/or Graduate Membership of the I.E.E., with some training as a Mechanical Engineer.

Salary according to qualifications, age and experience. Please reply giving full details of career to date, and present salary to—Box No. 4734, c/o 117 Piccadilly, London, W.1. (P 550)

TELECOMMUNICATIONS (RADIO TRANSMISSION) ENGINEER required by large organisation in the North West to train for position in Technical Publicity Department.

Applicants should be aged 25-30 years, and should have a good general educational background with the ability to write clear concise English. A sound knowledge of modern telecommunications techniques, including V.H.F. and U.H.F. multi-channel systems and frequency-shift signalling practices, essential.

The position is on the established staff of the Company, with contributory Pension Fund, and usual staff conditions and amenities. Please write to Box No. 434, Dorland Advertising Ltd., 18/20 Regent St, London, S.W.1, giving details of age, qualifications and experience. (P 711)

THE ASSOCIATED ETHYL COMPANY LIMITED, has vacancies for DRAUGHTSMEN in the Mechanical, Civil, Electrical and Instrumentation Sections of the Engineering Department at its Ellesmere Port Works.

Candidates should have had a sound practical training followed by at least three years' experience in a drawing office and have obtained the Higher National Certificate or be currently studying for same.

Starting salary will be offered commensurate with age, qualifications and experience.

Applications should be sent to the Deputy Manager—Personnel, The Associated Ethyl Company Limited, Ellesmere Port, Cheshire. (P 709)

THE ENGLISH ELECTRIC CO., LTD., at Stafford, has interesting internal vacancies for ENGINEERS to assist with commercial aspects of contracts for comprehensive hydro-electric schemes. Applications are invited from those having experience of this type of work and also from young engineering graduates or H.N.C. holders having just completed an apprenticeship and who wish to pursue a commercial career in industry. Please apply to Dept. C.P.S., 336/7 Strand, W.C.2, quoting ref. No. 756E. (P 583)

THE BURMAH OIL COMPANY LIMITED has a vacancy in their Overseas Organisation for an ELECTRICAL ENGINEER who would be responsible under supervision for installation of Generating and Distributing Plant, Switchgear, Motors, etc. and operation/maintenance thereof. Applicants must have served a recognised apprenticeship and hold H.N.C. or equal. Single man not over 28 preferred. Attractive salary, currently augmented by cost of living allowance; generous home leave with passages paid both ways; kit allowance; medical attention; Pension Fund benefits and free furnished quarters. Write stating age, qualifications and full details of training and experience to The Burmah Oil Company Limited, Overseas Staff Department, Britannic House, Finsbury Circus, London, E.C.2. (P 745)

THE TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD., have the following technical vacancies:

1. SUPERVISOR for Power Cable Export Sales Section. G.C.E. or equivalent. Some qualification in Electrical Engineering desirable.
2. TECHNICAL ASSISTANTS for research and development work in connection with high voltage polythene insulated cable. National Certificate standard in Electrical Engineering
3. ASSISTANT with experience in electronic apparatus. National Certificate in electronic apparatus.

Pension scheme, five-day week and all welfare facilities. Salaries in accordance with qualifications and experience. Write details to: Personnel Manager, Telcon Works, S.E.10. (P 713)

TRANSFORMER DRAUGHTSMAN required, fully experienced in all types up to 2,500 kVA. Full particulars giving age, experience and salary required to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. (P 698)

TRANSFORMER DESIGNER required by progressive company in connection with the manufacture of large power transformers up to 20 MVA. Applicants should be suitably qualified and have a sound engineering training. Reply, stating age, experience and salary required to—Box No. 4221, Electrical Times. (P 628)

TELECOMMUNICATIONS (LINE TRANSMISSION) ENGINEER required by large organisation in the North West to train for position in Technical Publicity Department.

Applicants should be aged 25-30 years, and should have a good education background with the ability to write clear concise English. A sound knowledge of modern telecommunications techniques, including coaxial and other multi-channel carrier telephone and telegraph systems, essential.

The position is on the established staff of the Company, with contributory Pension Fund, and usual staff conditions and amenities. Please write to Box No. 438, Dorland Advertising Ltd., 18/20 Regent St, London, S.W.1, giving details of age, qualifications and experience. (P 712)

YOUNG ENGINEERS interested in gaining experience of the erection of lattice tower, concrete and wood pole Overhead Transmission Lines and willing to serve either at home or overseas. Some technical background up to H.N.C. (Electrical) standard desirable, but previous experience of this kind of work not essential. Pension Fund. Write, giving full particulars and quoting reference C/76/55 to Staff Officer, British Insulated Callender's Construction Company Limited, 30 Leicester Sq, London, W.C.2. (P 702)

WHIPP AND BOURNE LTD. require DRAUGHTSMEN with experience of medium or high voltage switchgear. Apply with full details to Switchgear Works, Castleton, Rochdale, Lancs. (P 734)

APPOINTMENTS WANTED

INSTALLATION ENGINEER with experience of measuring requires position as Measurer. Air Ministry contracting experience.—Box No. 4261, Electrical Times. (P 765)

SITUATION required in FRANCE by ex ARMY TECHNICAL OFFICER, age 37, Proprietor of Electrical Contracting, Radio and Television business. Extensive knowledge of Electrical Contracting and Electronics, also business side of above. Serious illness of French wife reason for change.—Box No. 4249, Electrical Times. (P 697)

AGENCIES

M.A.A.—THE BADGE OF A GOOD MANUFACTURERS' AGENT. Manufacturers requiring reputable Agents are invited to communicate with the Secretary, The Manufacturers' Agents Association of Great Britain and Ireland (Inc.), Rosebery House, 8 Breams Buildings, London, E.C.4. Membership available to established agents only. Particulars supplied. (P 118)

AGENT required with Electrical Wholesale connections in South Wales, to sell additional line of high quality products at competitive prices.—Box No. 4243, Electrical Times. (P 684)

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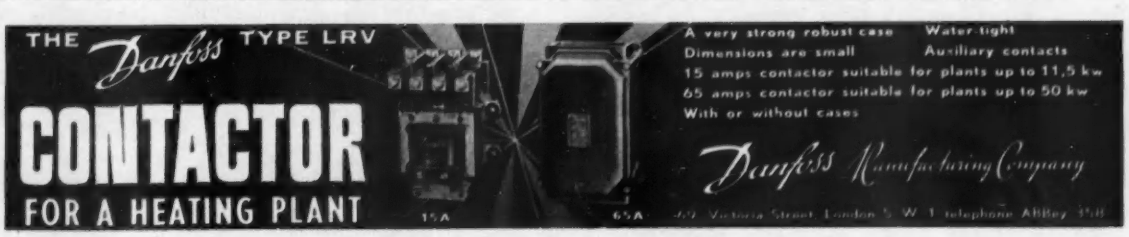
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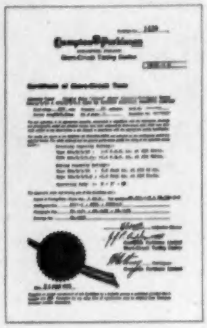

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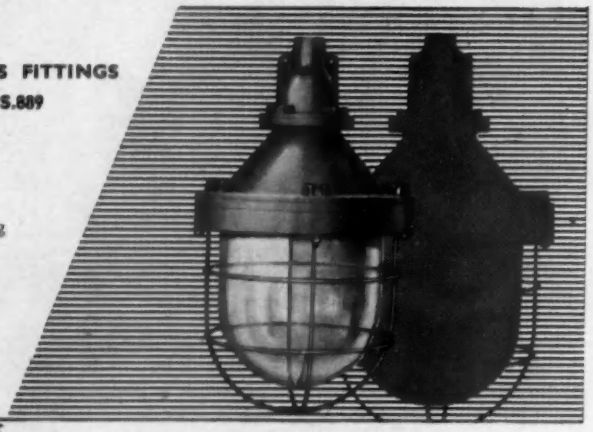

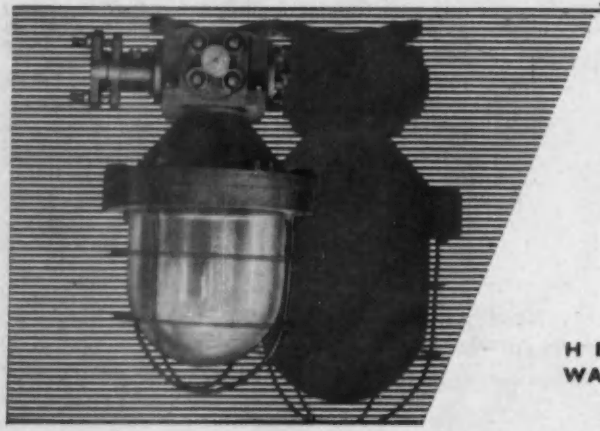

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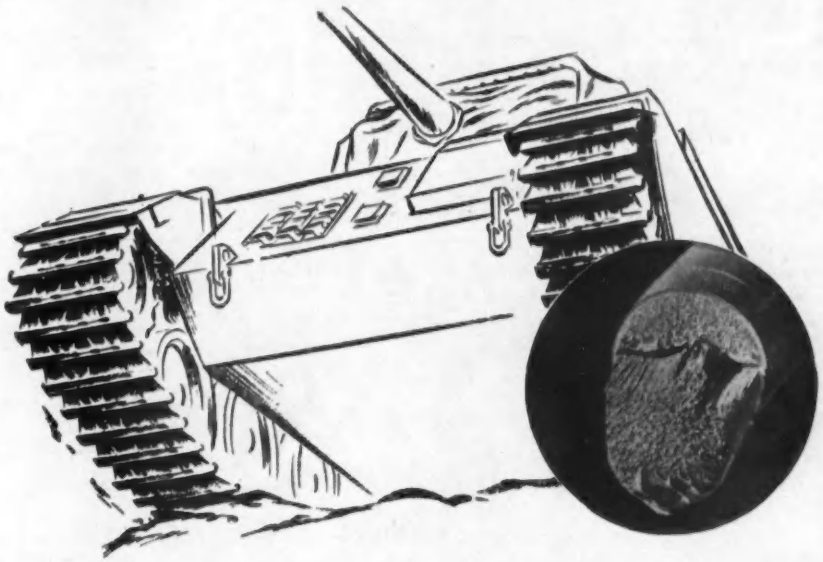

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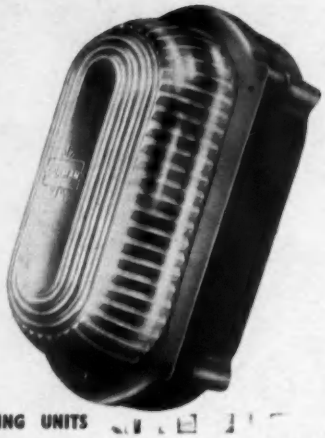

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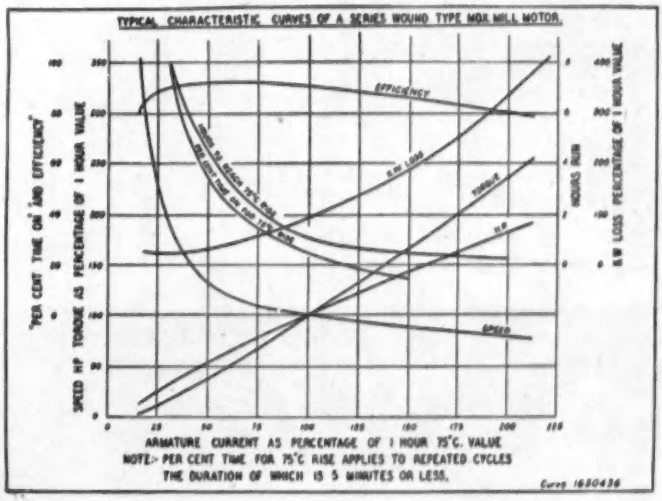
Above: Metrovick type MDX 230-volt d.c. mill motor designed to conform with standard A.A.I.S.E. ratings.
Right: Typical characteristic curves of a series wound type MDX mill motor.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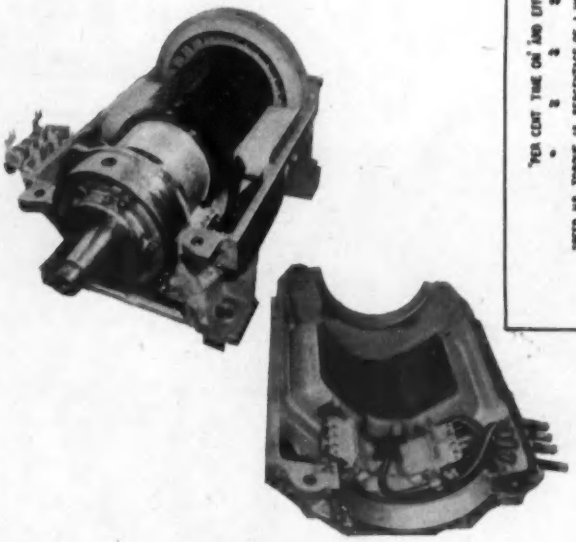

All top-to-bottom connections are made outside the machine, so the top half can easily be removed for maintenance purposes. The armature, complete with its bearings enclosed in dust-tight cartridge-type housings, can then be lifted clear of the bottom half of the motor. Feet on the bearing housing support the armature when it is removed from the frame.

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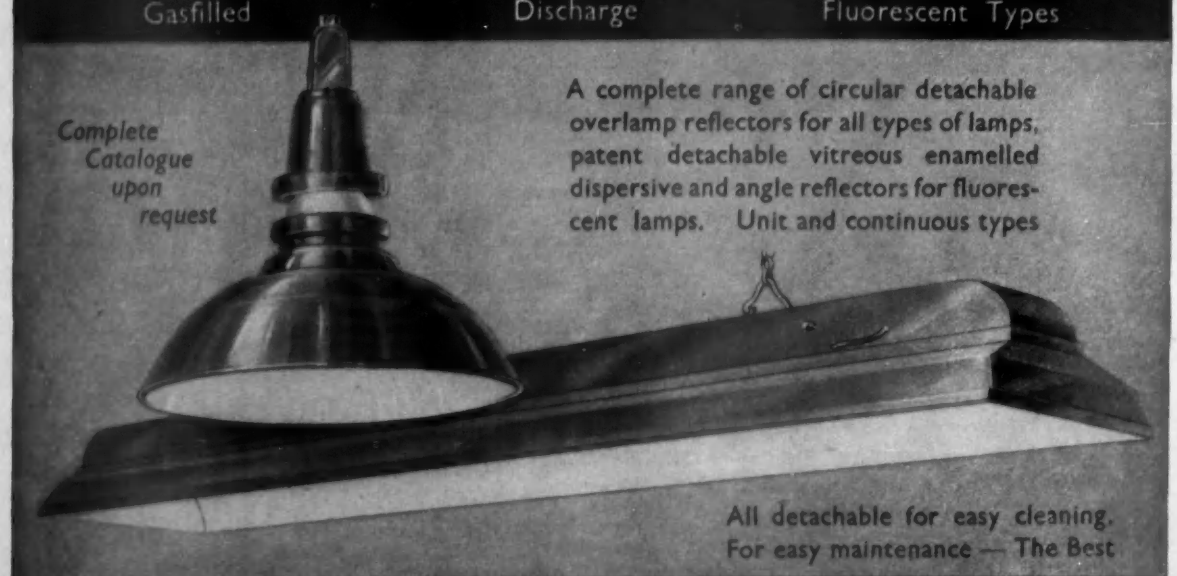

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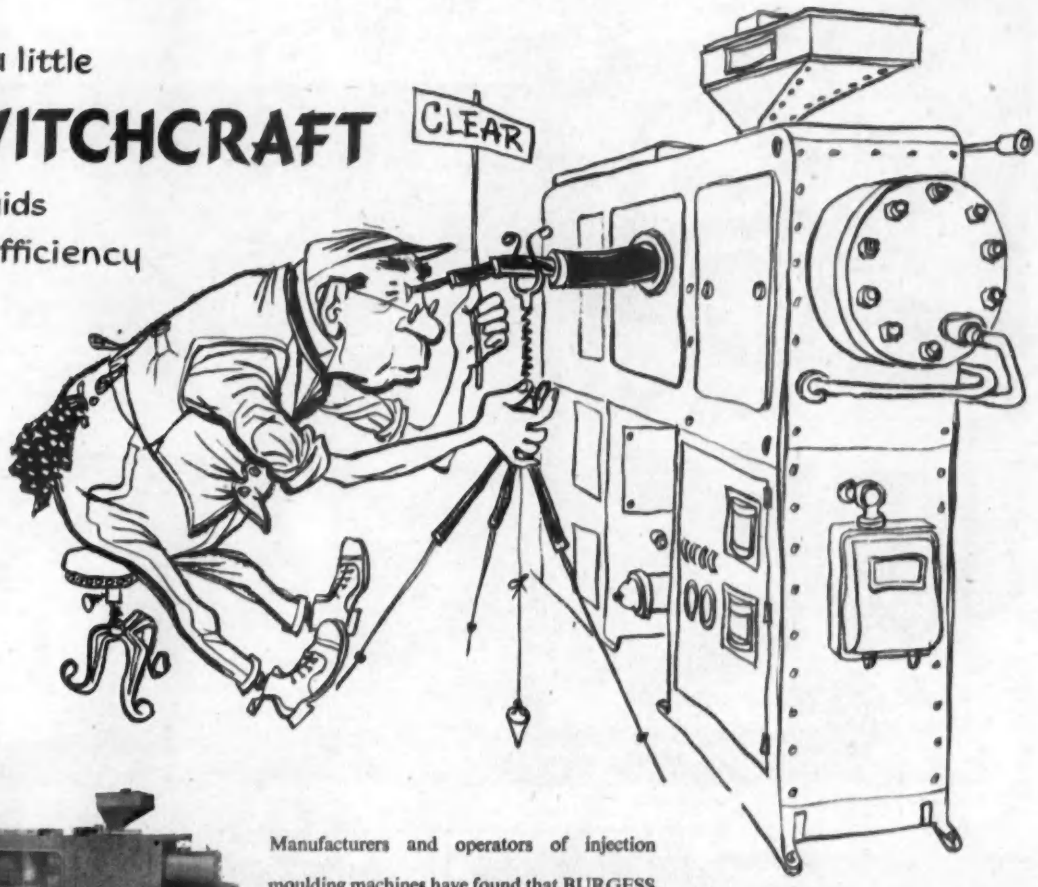
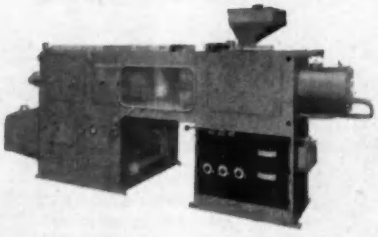
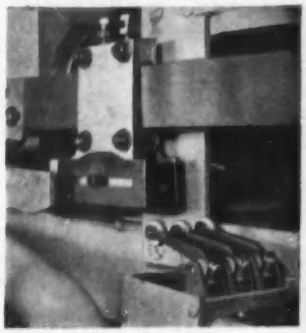




Manufacturers and operators of injection moulding machines have found that BURGESS MICRO SWITCHES solve many problems; in doing so they provide infallible accuracy where "the human element" could make costly mistakes. The 'Peco' Model M40 8/12 oz. Injection Moulding Machine illustrated, for example, uses eight BURGESS MICRO SWITCHES—four type Mk. 3BR-MS[1] and four type Mk. 3BR-MS/A—which start and control the moulding cycle and operate safety devices. The three type Mk. 3BR-MS/A MICRO SWITCHES seen in the detail illustration on the right are actuated by cams and control a sequence of operations. Another BURGESS MICRO SWITCH provides sensitive protection to the tools by preventing the application of high pressure after the platen has closed under low pressure should there be any foreign matter—even something so small as a piece of paper—between the die faces.



The type Mk. 3BR-MS/A BURGESS MICRO SWITCH is provided with a die-cast zinc alloy housing with a drop forged steel actuating arm and case hardened steel roller. The type Mk. 3BR-MS switch has a similar housing, but no actuating arm. For further details of these models and many more, please consult CATALOGUE No. 50/D.

Photographs above and left by courtesy of the Projectile & Engineering Co. Ltd.

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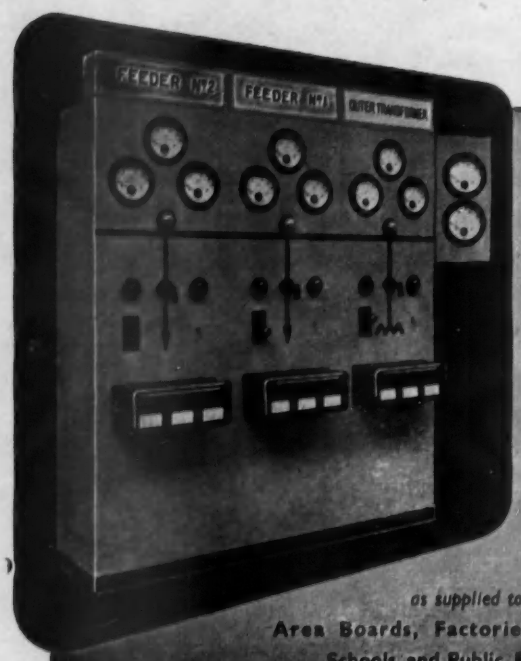

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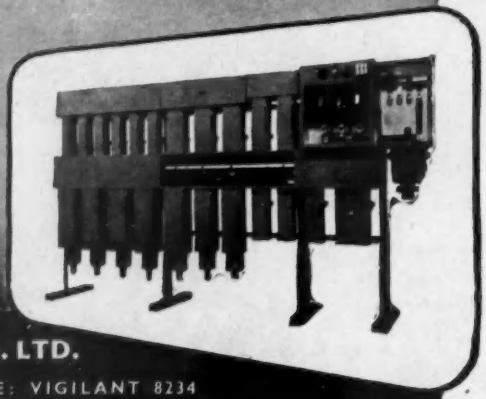

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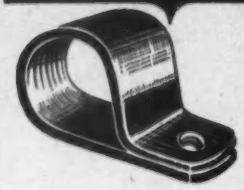

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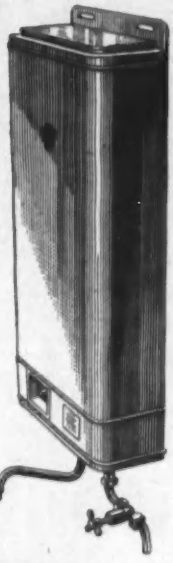

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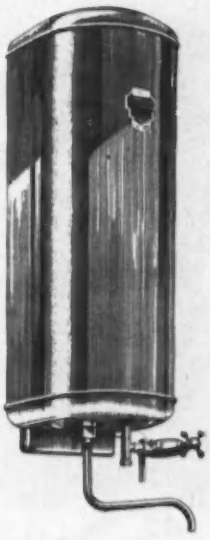

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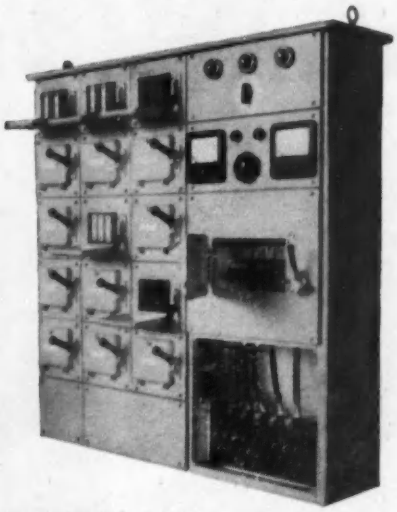

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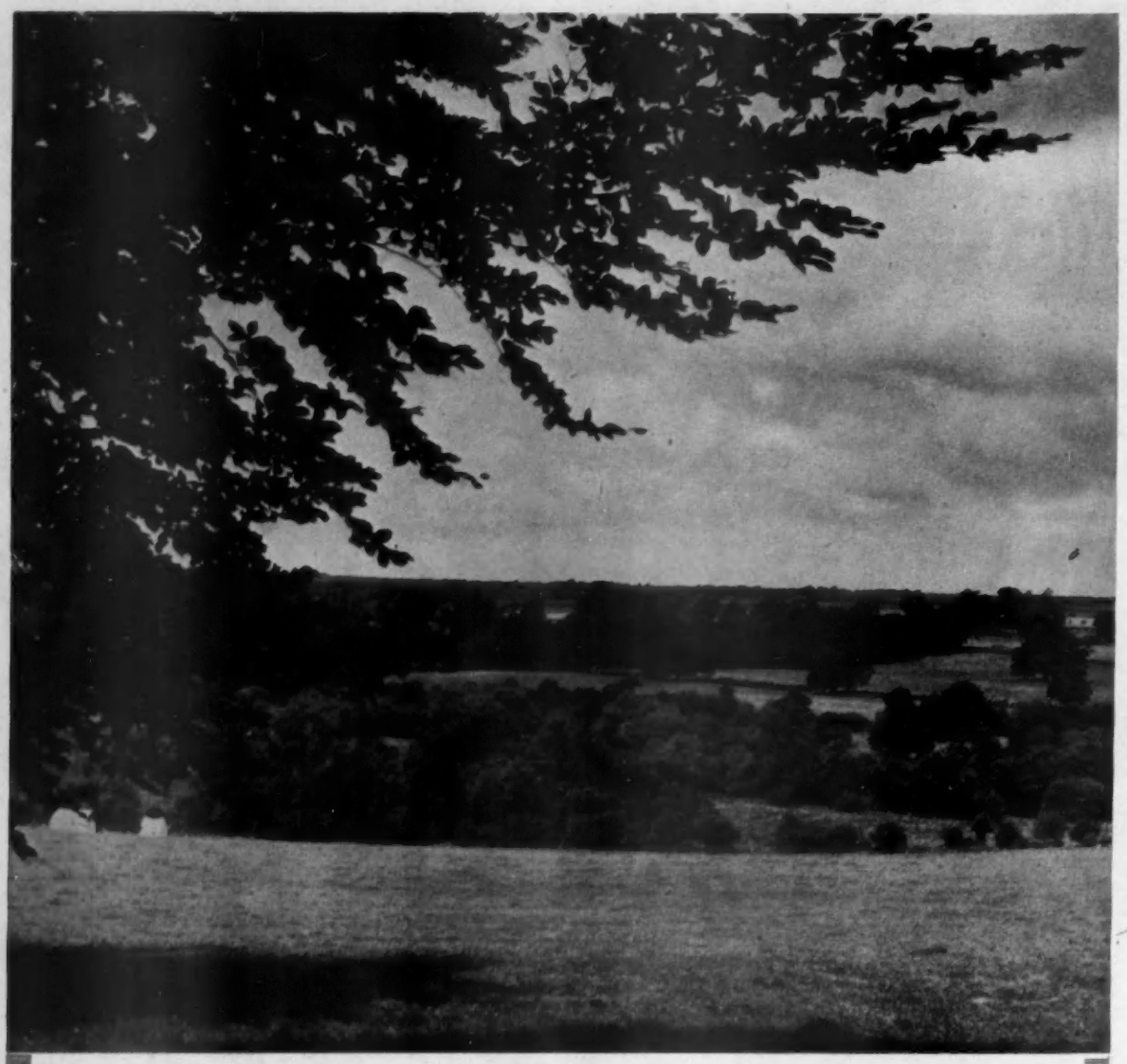

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